The Builder.

VOL. XXVI.—No. 1349.

The Social Science Association.

THIS Association is again getting to work vigorously. Mr. G. W. Hastings having resigned the office long held by him of General Secretary, has been elected chairman of the Council, and, in that capacity, delivered, at the invitation of the executive committee, the opening address of the new session, in which he referred not to one section specially, but to all; carrying out the idea on which the Association was founded, that Social Science is a unit; that, while its component branches may be separately treated (and with advantage) as to details, they cannot be dissevered in principle. Nor is it only that the several sciences concerning the well-being of a community form a common philosophy which must be dealt with as a whole; it is also that the practical work which the study of these sciences evokes requires a reciprocity of labour. The workers in these various fields are in want of each other. The lawyer needs the economist, and has often grievously erred for lack of him. The political economist needs the sanitarian to teach him how much of the productive energy of a nation depends upon a due observance of the laws of life. The sanitarian on his part has need of the jurist that he may learn into what mould the new energies of hygienic government can best be cast. All have sore need of the educationist, to warn them how futile is every effort for national improvement which does not carry with it the assent and purpose of an understanding people. Nothing, then, said the speaker, can be amiss which impresses on our members the unity of our science and the reciprocity of the objects which we pursue. We cannot work at everything; some of us can spare time, and that with difficulty, for no more than a single section; but we all can and ought to be interested in the whole, and be ready to exchange advice and help with each other.

Speaking of the subject which underlies all the problems of Social Science, national education, he maintained that without the solution of this question none other can be followed up to a good result. It is true much has been done during the last thirty years; but after all the efforts made, after all that has been effected by private exertion and by the application of the Privy Council system, there remains in the country a large residuum,—to use a word which has been brought politically into vogue during the last two years,—who have not been as yet subjected to the civilising and refining influences of any education whatever. When the Association held its meeting in Manchester, the fact was brought out by the Manchester Education Society that there are 50,000 children there attending no school. Some months before the London Diocesan Board of Education had published a statement that, in London alone, there were about 150,000 children so situated; so that, if these figures are to be taken as accurate, there are in London and Manchester together about 200,000 children who have not been touched by all the educational efforts made by the Government and by private individuals. This residuum, it was his belief, as it is ours, never can be dealt with unless some obligatory system of education be established. In a rural parish in Worcestershire, the children of every single family in the parish except one had been gathered into a school. The half-dozen children of that family were running about ragged, dirty, uncared for, perfectly ignorant, and growing up, no doubt, to be in the end, vagrants or criminals. Any one would naturally suppose that the parents were too poor to pay the 2d. per week which was required for each child, or that they had some religious objection. So far from that being the case, they were a great deal more able to pay than a large number of those who regularly sent their children to school. They had no objection to allege against the school or the teaching; they simply ignored the benefits of education, and steadily refused, in spite of all that could be said, to avail themselves of the advantages placed within their reach. How is a case of this sort to be dealt with except by some obligatory system? Surely, it cannot be alleged that parents have any *right* to deprive their children of education. What right have they as against the children? What right have they as against the community? For the children, ignorance means mental incapacity, moral degradation, future disadvantage for competition in the labour market, deprivation, poverty, and wretchedness. For the community it means an enlargement of our prisons and workhouses, with the consequent burdens on the rates. For out of this residuum of neglected children is hatched the spawn of our criminal, vagrant, and pauper classes. It may be said,—apply the Industrial Schools Act to cure the evil. But to do so is to ignore the principle on which the Act was passed. That principle was the sound idea of prevention, so fruitful of good in many branches of social science. Within all our memories it was the custom to send criminal children to prison, to be made worse instead of better. A few wise persons, persevering through countless defeats, at length persuaded the Legislature to sanction the establishment of reformatory schools, where young criminals might be taught habits of morality, and thus be prevented from becoming the inmates of prisons. Some time after it was found advisable to establish industrial schools by another Act, thus creating a cheaper machinery to deal with still younger children, beggars and vagrants, and prevent them from growing into the subjects for reformatories. Surely, it is only logical and politic to push the principle one step further, to make your net still closer to catch the smaller fishes, and to provide that obligatory education which shall prevent the children whose parents neglect their best interests from idling into vagrancy and vice.

We have a right to compel every child to be vaccinated, because if unvaccinated it may give small-pox to others; we have a right to compel every householder to drain, lest he breed fever among his neighbours; and *pari ratione* we have a right to require that no child shall be left in the darkness of ignorance, to grow up a pest and burden to the community.

This is the great educational question of the hour, the one which most demands attention, because it is the one most urgently requiring help. The speaker was more hopeful that the well-to-do artisans will obtain as much technical education as they care to have, and in the way they want it, than we are. Something must be done to lead them to care more for it than the majority do. Still we fully agree with him, as our readers may know, that primary education for *all* is the great requirement. Unfortunately, the most potent of all obstructions, sectarian differences and religious prejudice, stand in the way of their salvation. Mr. Hastings quoted a remarkable utterance by Lord Brougham, many years ago, on this subject. When speaking of the sectarian opposition to national education he exclaimed, that the contempt cast by history on that Council of Constantinople which disputed on a text while the Turkoman, the enemy of all their texts, was thundering at the gate, would be but as a murmur of dissent compared with the loud shout of universal scorn which all mankind in all ages would send up against us if, on the flimsy pretext of theological differences, we left to destruction the helpless children of our poor. Surely it is time that those who appreciate the importance of this question, who know the facts, and who believe that national retribution waits on national neglect, should make one vigorous effort more to ensure the elements of education to every child in the community.

Coming then to the section of health, the speaker urged the importance of the great science of State medicine. State medicine means simply the care of State health, as opposed to that of private health. A physician in private practice looks after the health of individuals; a physician in what may be termed public practice looks after the health of the community. Physicians, no doubt, so long addicted themselves solely to the cure of maladies, that they neglected the still nobler art of preventing disease; but the medical profession has now, for some time past, understood its wider destinies, and yearly sends forth a large number of highly-educated men impressed with the supreme importance of sanitary functions, and qualified for their discharge. What is now needed above all is a better organization. In the first place, the statute law on the subject is chaotic and contradictory. The different Acts still conflict in their provisions, and in many cases it is hard to know to whom recourse is to be had for the removal of nuisances, or the improvement of sanitary arrangements. The real remedy is the thorough revision of the whole law relating to public health, and its condensation into a single statute. In the next place, we must have a better sanitary administration. We want not only a consolidated Act, but a trained and organized staff in town and country to carry out its provisions. Every considerable town should have its own medical officer of health. Many already possess that advantage. The City of London long ago set an excellent example; Liverpool and Glasgow have followed in its steps; Manchester, influenced by the representations made when the Association met there, has recently had the wisdom to adopt the same course; and it is to be hoped that Birmingham will not long be behind. Small towns may be joined by rural districts around, or several towns may unite in paying the necessary salary. We trust with Mr. Hastings that the joint committee now sitting will continue to press, both upon Parliament and upon the Ministers of the Crown, the necessity of an improved organization of State medicine. Let them also keep a vigilant eye on the commission, and take care that it is fully supplied with information, and that its inquiries are directed to the proper points.

In the department of Economy two subjects were particularly observed on: the Poor Law and trade unions. As to the latter, he did not believe it to be true that trade unions had always, or nearly always, done mischief. So far from unions having, on the whole, encouraged strikes, he was convinced that, on the whole, they had tended to diminish those calamities, though there was no question that when they have organised a strike they have naturally made it much more formidable than it would otherwise have been. It was certain that the outrages which have disgraced

some trade unions were condemned by the largest proportion of the working men who belonged to societies of that kind throughout the country. But, on the other hand, he was astonished at the views expressed, and the strength of the language used, at the meeting held by the Association when Mr. Gladstone presided; not so much, indeed, if at all, by the working men, as by some of their zealous friends. There seemed to be a lunatic idea that some malice against working men was involved in any criticism of trade unions. Now, if it be the case, as he believed it to be, that trade unions are capable, when wisely managed, of doing a considerable amount of good (though no one can suppose them to be more than stepping-stones to higher things, a necessary defence against other evils, temporary alleviations of mischief in the body politic, and which, therefore, will gradually pass as our civilization expands into higher organizations of social life),—if trade unions have good in them, surely it follows that the more you eradicate anything that may be evil in them the more you will confer a benefit on those bodies, and the class who support them. The man who points out any errors in trade unions, or helps to expose any abuses that may have been perpetrated in their name, is surely the best friend they have; and the working-men can surely follow no course better adapted to their interests, than that of joining in the most vigorous exertions to put down any mischiefs that may have arisen anywhere out of these societies, and to bring to justice all who have abused, for their own criminal purposes, the lawful power of combination. He did not conceal his opinion that by far the most useful function of the Association would be to spread a knowledge of the principles and mechanism of those industrial partnerships which, by identifying the interests of employers and employed, absolutely preclude their quarrelling. Only second to that is the task of diffusing information, as was done the other day by the discussion in Birmingham, as to those means of conciliation which have been so successfully adopted in some trades and districts, so that when the conflicting claims of capital and labour do unhappily produce differences, those differences may be prevented from assuming the calamitous form of a lockout or strike.

The speaker then approached the subject of Jurisprudence, on which he spoke at some length, but we may not follow him further in his comprehensive address than to say he rightly dwelt on the necessity that exists for the revision and condensation of the whole body of our English law. Such a work would not only be an immense boon to the public in itself, but it would also be productive of great advantages indirectly, through the improvements which it would compel the Legislature to make in the actual substance of the law. It lies at the root of the amendment of the law, precisely as national primary education, and as the organization of State medicine, lie at the root, respectively, of educational and sanitary improvements.

At a sessional meeting after the opening night, a paper "On the Fundamental Reform of the English Poor-law," by Dr. W. B. Richardson, was read, and provoked a lively discussion. It will be seen, from what we have said, that the Association has commenced the session with spirit, and some of our readers learning it is not alone when the Social Science Association goes out of town that it labours, may be led to find their way to Adam-street, Adelphi, and lend their aid in a good and pressing work.

Advertisements have been recently issued, announcing the intention of the Association to elect a secretary: a barrister, or gentleman studying for the bar, it was stated, would be preferred. Some twenty-five candidates sent in testimonials. In the course of two lengthened sittings, the executive committee reduced this number to six, whom they afterwards saw personally. The list was then reduced to two, Mr. Alsager Hay Hill, and Mr. Edwin Pears, of whom the latter was ultimately elected to the office, subject to the approval of the council.

The Hillfield Estate, Gloucester.—The first portion of a terrace, consisting of seven houses (ultimately to be increased to twenty-six), has been commenced on this estate. It is in contemplation to continue the terrace early in the spring, and also to erect a number of semi-detached villas. The architect is Mr. Maberly, of Gloucester, and the builder is Mr. Arthur Parker, of London.

MR. LAYARD ON MOSAIC DECORATION.*

The basilica of Monreale, near Palermo, magnificent as it undoubtedly is, and superabundantly rich in mosaics, which cover, according to the Duke of Serra di Falco, no less than 97,973 Sicilian palms (rather less than a foot each) of enamel mosaic (*opus Alexandrinum*) and 13,041 of pietra dura mosaic, and which required for their execution the continuous labour of 150 mosaicists for three years, does not produce the same impression as St. Mark's. This arises from the roof being in timber, from the absence of those numberless curved surfaces which distinguish the Venetian church and which are especially suited to mosaic, and from the greater diffusion of light. The effects are less solemn and religious than those of St. Mark's. Still, however, it is a glorious building, and furnishes to the architect an invaluable collection of beautiful ornaments of a particular period and style, the church having been entirely built and decorated towards the end of the twelfth century. It affords, too, an important example of the use of mosaics for pictorial purposes on side walls, which at Monreale are covered with stories from the Old and New Testaments. The colossal form of the Saviour on a gold ground, in the semi-dome over the central apse, has also a grand and imposing effect, and is a fine example of the manner in which this architectural feature in a church can be appropriately decorated with a single figure. The lower parts of the interior walls are panelled with marble slabs, divided by bands of mosaic in endless variety of designs. Unfortunately, the ancient basilicas of Ravenna have either been allowed to fall into decay, or have been so much changed by modern restorations and alterations, that we can no longer judge of the effect which the mosaics they contain must have produced when the whole ornamentation of the interior was in complete harmony with them. What is called the Jesuit architecture of Italy,—that vulgar renaissance which is so offensive to good taste, and so utterly opposed to all solemnity and true religious feeling,—introduced the fashion of breaking up the interiors of ancient churches by the introduction of side chapels, and of vast altars composed of columns, cornices, and pediments of marbles of every hue, piled up without any reference whatever to the surrounding architecture, or without any pity for the frescoes and ornament which may ever have adorned the walls.

The original simplicity and symmetry of almost every sacred building of any antiquity in Italy has thus been detroyed. Most fortunately St. Mark's, for various reasons,—amongst them, perhaps, the jealousy with which the clergy has preserved its antique church ritual,—has been spared, and remains, both in form and ornamentation, nearly as it was intended to be by its builders.

In the basilicas of Ravenna we can only judge of each mosaic as an individual example with reference to the actual work and the capabilities of the material: we can form no adequate conception of the general effect which it was calculated to produce as a portion of the general decoration. The richness and harmony of colour are neutralized by the vast spaces of plaster and naked walls by which in most instances these mosaics are surrounded, with the exception, however, of the tomb of the Empress Galla Placidia, which still maintains as a whole much of its ancient character and beauty. But in themselves they are deserving of the most careful study as belonging to the best period of early Christian mosaic art. They are especially valuable to the architect as affording some of the finest examples of the treatment of pictorial mosaic, and of the technical qualities of the material. For beauty and purity of design, which nearly approaches that of the Classic times, and for exquisite harmony of colour, the mosaic of the "Good Shepherd," in the tomb of Galla Placidia, is one of the most perfect specimens of the art that can be found. For the processional treatment of subjects, and for ancient costume and architecture, the basilicas of Ravenna furnish most excellent examples, especially the Church of St. Apollinare Nuovo. Indeed, at no period were the use and capabilities of mosaic so thoroughly well understood as in the fourth and fifth and early part of the sixth centuries.

Before concluding this branch of the subject, I would mention, as an example of exterior decoration in mosaic, the cathedral of Orvieto. To judge of the full effect of the mosaic pictures which adorn its richly-decorated façade, it must be seen from a distance. Its position, standing majestically on a platform supported by precipitous cliffs rising out of a wide valley, is admirably suited to the display of its richly-ornamented façade. The mosaics, which are modern, are not of the best style, and are too pictorial for the architecture, unless seen from afar; but the effect is undoubtedly very gorgeous, especially on a bright day, when the façade glows in the sunlight with all the hues of the rainbow. I should hesitate, however, to recommend similar decoration for imitation in this country.

No one acquainted with the magnificent examples of mosaic decoration which I have described, will probably be inclined to doubt its great value, at least for the ornamentation of sacred edifices; and I think that those who have no prejudices and preconceptions on the subject, will be equally disposed to agree with me that, if mosaic can be used effectively and advantageously in sacred edifices, there is no reason why it should not, with equal propriety, be employed in secular buildings. All that is required for this purpose is a knowledge of the principles which regulate its proper application, and of the capability of the material.

In many respects mosaic is undoubtedly preferable to fresco for decoration, especially in our climate, even without reference to the atmospheric influences upon wall-painting. It is more durable; it is more lustrous; it is more effective when employed at a considerable distance from the eye; it is far richer and more brilliant, especially when gold grounds are extensively used, in this subdued and frequently insufficient light of our climate; and, lastly, in case of injury or deterioration from dirt, or other causes, it can be restored and cleaned without any detriment or loss of character to the original work. However, when making the observation, I would add that fresco painting and mosaic have distinct and separate attributes and capabilities, and that, when both can be employed under equally favourable conditions, as in Italy, they need not interfere with one another; and this reflection leads me to endeavour to point out what the proper attributes and capabilities of mosaic decoration really are.

Let me remind you, in the first instance, that I am not dealing with that minute and elaborate mosaic work chiefly practised at Rome, which is intended rather for the reproduction of easel pictures and altar-pieces than for architectural decoration. These are things to be avoided,—not to be imitated,—and with which the architect has nothing to do.

Legitimate mosaic decoration, like all true architectural decoration, should, in the very first place, be made subservient to the architecture, or, rather, it should be made essentially part and parcel of the architecture. The truly great architect will devise and superintend the decoration of his own building, even, if possible, to the minutest details; for there is nothing which adds more to the effect of an architectural monument, and to its grandeur and nobility of character, than the feeling that one clear, well-defined, and lofty conception pervades the whole of it. When this identity of conception is apparent in a building, however inferior it may be in certain details to another edifice in which this homogeneity is wanting, it will always be far superior to it in the general effect that it will produce. In order, then, to make mosaic decoration harmonize with architectural lines and forms, all the best designers for mosaic have sought to give their cartoons a certain conventional and architectural character, and have avoided any attempt to make the mosaic look like pictures in oil. As, from the nature of mosaic, tesserœ placed together with more or less precision, it is best seen at a distance; it should be used, especially when pictorial, at a certain height from the spectator. There are no mosaics in St. Mark's less, I should think, than 10 ft. from the pavement, and the greater number are at a very considerable elevation. Consequently, distinctness of outline, not only in the figures themselves, but in their extremities and parts, so that they be not lost in the mass, is required. When grouped, each figure should stand out boldly, and not interfere with any other figure. For this reason, the mosaicists of the best periods of the art generally preferred the processional treatment of their figures. Any

* See p. 887, *ante*. In the previous notice, the Church of S. Apollinare in Classe and that of S. Apollinare Nuovo are stated in one part to be in Navarre. They are in Ravenna.

attempt to produce different planes of distance which require, to be properly defined, all the subtle tints of the painter's palette, should be avoided. The outlines should be distinct, well-defined, and marked, somewhat heavily; their darkness and thickness being regulated according to the elevation of the mosaic. This rule applies to both pictorial and purely decorative work. Reference should be specially had to the style of architecture of the building; always, however, bearing in mind, that although the general arrangement of lines and treatment of the subject may be varied to suit it, yet that, whether mosaic be introduced into a Classic, Gothic, or Renaissance edifice, the general laws which regulate its use are the same.

I may cite as an example in illustration of what I have said, the semi-dome over the most northern, and the lunette over the adjoining exterior entrance to St. Mark's Church. In the first instance, the original mosaic of the thirteenth or fourteenth century (its precise date is doubtful), represents a procession of figures bearing the body of St. Mark to the church, a view of which, as it appeared when the work was executed, is seen in the background. The subject, simply and somewhat rudely treated, harmonises perfectly with the surrounding architecture. The mosaic of the adjoining lunette represents the Doge and Venetian magistrates venerating the body of St. Mark. It was executed from a cartoon by Rizzi, and is probably one of the finest known examples of enamel mosaic, both as regards execution and the wonderful beauty and richness of the colours, especially the blues, purples, and golds. But this mosaic, however admirable in design and in execution, does not combine or harmonise with the architecture. It looks like a fine picture suspended on the façade, and which might have been hung anywhere else; consequently its effect is infinitely less pleasing than that of the earlier, simpler, and ruder mosaic. What the effect must have been before the original mosaics were removed to receive the later, may to some extent be judged of by Gentil Bellini's great picture in the Academia, in which the façade of St. Mark's is represented with almost photographic minuteness, as it appeared in the fifteenth century. No one will doubt that it was superior to that produced by the modern imosaics. I may add that, in order to increase its effect, almost all good pictorial mosaic with which I am acquainted is surrounded by a band of appropriate ornament, the width of which depends upon the elevation and position of the mosaic picture.

It may be said that these considerations as to the designs for mosaics should be addressed to the painter rather than to the architect; but I contend that the design for mosaic, whether pictorial or simply decorative, is essentially the business of the architect, and that unless he attends to it and makes it himself, or causes it to be executed under his own immediate direction, he will never produce a really great architectural monument, if mosaic decoration is to be a prominent feature in it. As I have ventured to remind you on a previous occasion, architecture is the noblest of all arts; for when rightly understood, sculpture and painting become her handmaidens. When they were so, the most beautiful and perfect edifices were produced, whether in Greece or Rome, in Italy or more northern climes. It is the architect who, taking this lofty view of his profession, and educating himself to carry it out, will erect the greatest monuments and earn the highest fame.

Although the chief merit of the mosaic must depend upon the designer of the cartoon, much is left to the skill and judgment of the mosaicist who executes it. It is surprising how much effect may be produced by a judicious selection of tesseræ of different sizes for different parts, by the mixture of tints in large masses of one colour, such as a gold ground, so as to avoid monotony of tone, and by the dexterity with which the arrangement of the tesseræ is made to follow leading lines and the undulations of flesh or drapery. The interval between the tesseræ must be regulated according to the distance, and can also be made to contribute to the general effect. These things and the proper selection and matching of the tints form the duty of the mosaicist.

Having thus endeavoured to place before you the nature and capabilities of mosaic, I would invite your attention to the main objects of this paper, which are two. First, to ascertain whether this mode of decoration can be advantageously introduced into this country; and secondly, if so, whether there be the means of employing it on an adequate scale.

With regard to the first point, I have already expressed my opinion on the subject of the decoration of our public monuments, as well as our churches. Not only am I convinced that pictorial decoration might be introduced into such edifices much more extensively than it has hitherto been, but that it could be so introduced very much to the public advantage, both as regards public enjoyment and public instruction. But, unfortunately, the apparent failure of fresco and other such painting has discouraged the public, the architect, and those who have the superintendence of our national monuments. It is a matter for regret that mosaic was not more generally known, and had not been introduced into England when the decoration of the Houses of Parliament was commenced. I hope that it is not yet too late to introduce it into a building which is eminently calculated, especially in its halls and passages, dimly lighted through stained glass, for this mode of decoration. It was truly a noble idea to make the walls of the great palace of the representatives of the nation the record of her history, and we must deplore that it has not been fully carried out, principally owing to the failure of the materials employed. It will be a national loss if the fine wall pictures of Mr. Maclise should perish, whether we regard them as monuments of the genius of the painter or as most careful representations, in every detail of costume, of great events which have occurred almost within his time. Had they been executed in mosaic, we should no doubt have missed the skilful touch of the master, but we should have preserved designs worthy of him, and he would have been enabled to employ the years that have been consumed in the actual manual labour required to execute such vast works in preparing other cartoons for the completion of the decoration of the wall, in two panels alone of which the battles of Trafalgar and Waterloo are now represented.

The works of some of the principal painters of our time, executed at no small cost to the nation, will perish in all probability within a few years, and our only chance of preserving any memorial of them is by reproducing a portion of them at least in mosaic.

Besides the Houses of Parliament, we have rising up around us museums, picture galleries, public offices, courts of law, town-halls, railway stations, and other edifices. Each of such buildings might, like the Houses of Parliament, be made to contribute something towards the instruction of the public and towards the elevation of the public taste by appropriate pictorial decoration in mosaic. They have blank spaces which need to be filled up, and which the architect would, perhaps, gladly fill up; but he hesitates to do so now with wall-painting, because he cannot satisfy himself that it will resist the effects of our climate, and the smoke and dirt of our principal cities. If a suitable and durable material were at hand, in which such pictorial decoration could be executed at a reasonable cost, he would probably avail himself of it. Judging from the manner in which mosaic in Italy and in the East, when used externally, as well as internally, has defied the ravages of time and weather, we may infer that mosaic, if of good quality, is precisely the material which would suit our climate and atmosphere. I cannot conceive anything more instructing and interesting to the great masses of the people than pictorial decoration carried out in a comprehensive and intelligent manner in our great public buildings. Millions have yearly to while away some spare minutes in railway stations, town-halls, and courts of law. We might make such places, as the Greeks and Romans did their public edifices, a means of teaching and amusing the people, and, at the same time, add much to their beauty and interest by representing on their walls great national events, or recording important scientific discoveries which have increased the prosperity and power of the country, or have contributed to our civilization and our intellectual development. As a familiar illustration of what I mean, I may mention that I learnt more of the different forms and employments of locomotive-engines than I had ever known before, when spending a quarter of an hour a few weeks ago in the railway-station of a small Italian town, round the principal hall of which were very artistically painted in lunettes every variety of engines for railways and the mode of their use.

In our museums and picture-galleries, with the exception of the South Kensington Museum, where a most praiseworthy and, on the whole, successful attempt has been made to introduce ornamentation on a large and complete scale, we have hitherto been sadly deficient in rich and appropriate decoration; and yet the value of a work of art, and the impression it is calculated to convey, are very much enhanced, as far as the general public are concerned, by the beauty or magnificence of the building which contains it, like a panel which gains by a rich and appropriate setting. Our National Gallery, for instance, is a disgrace to a great and civilised people. Its dirty floor of common boards, its coarsely-papered walls, its undecorated ceilings, its mean internal approach, have unquestionably a tendency to depreciate in public estimation the value of the treasures which it contains. Our pictures, crowded on the walls of such apartments, look as if they were hung there for an approaching sale in an auction-room. Thousands who visit the National Gallery, and for whose instruction and elevation its contents are partly intended, leave it without any adequate notion of the worth and beauty of what they have seen, merely because they cannot believe that things of real value can be so poorly cared for. There is something elevating and refining in rich and beautiful ornament when introduced into a public building, and depend upon it the working classes feel the influence of it.

Mosaic decoration is particularly fitted for our churches on account of the grand and solemn effect which, when employed in large masses, it is calculated to produce. It is especially suited to curved surfaces, such as domes, vaults, and apses, because, when thus applied, it produces an infinite variety of effects of light and shade, especially when gold ground is extensively used. These effects are constantly changing throughout all hours of the day. We may imagine what the dome of St. Paul's would have been had Wren's original idea of covering it with mosaics been carried out. Even the gloom of the dull and murky atmosphere of the City would have been conquered by the bright and luminous enamel, and those who have seen St. Mark's at night can picture to themselves the effect of an evening surface at St. Paul's when the golden ground of the overhanging dome would reflect the thousand lights beneath.

In connexion with exterior decoration, which has of late years become better understood and valued in this country, I would point out the use of gold mosaic as a ground to bas-reliefs, whether figures or ornament, in white marble and other materials. The Byzantines and Venetians were well aware of its worth for this purpose, and of the singular beauty and delicacy of its effect. There are some charming examples in the façade of St. Mark's.

In the best period of Italian art the sculptor was well aware of the beautiful effect of sculpture in white marble relieved by a gold ground, and the niches which received the statues on the exterior of the church of San Michele at Florence were for the most part lined with gold mosaic. An important consideration in the use of mosaics in England, and especially in London, is the facility with which dirt and the discolouration produced by smoke and soot can be removed from its surface either by simple washing or by the employment of an acid without the least detriment to its brilliancy. I understand that recently some of the most ancient mosaics at Ravenna, dating from the fifth century, have been cleaned, and that they are as bright in colour as when first executed.

Let me now, in conclusion, ask your attention for a few minutes to my second point, viz.—Have we the means of using mosaics for decorative purposes in this country?

In England we have never had a school of mosaicists. The few specimens of ancient mosaics that we possess, such as those in Westminster Abbey, were executed by Italians. An attempt was made four or five years ago by Mr. Cole, with his usual zeal for the promotion of applied art in this country, to found a school of workers in mosaic who were to employ tesseræ of terra-cotta, or, as they are technically called, "ceramic tesseræ," instead of enamel, for figures and ornaments. Some very creditable specimens were produced, principally by Messrs. Minton & Co. and Messrs. Simpson & Co., but the attempt does not appear to have been altogether successful. For certain purposes these terra-cotta or ceramic tesseræ are sufficiently effective, but they lack the richness, brilliancy, and luminous quality of enamel, and certain colours such as reds and purples cannot be pro-

duced, and they can never equal the effect of the gold of the Byzantine mosaics. Moreover, the gold being applied externally, and not protected by a film of glass, is liable to tarnish and to injury. As regards the durability of ceramic mosaics, I hesitate to give an opinion after the solemn warning of our president in his opening address of the session, against the indiscriminate use of terra-cotta, at least for external decoration. I will only mention this fact, that in repairing the mosaics of St. Mark's, it has been found that whilst the ancient tesseræ in enamel are perfectly preserved, those in terra-cotta and other materials (for such were mixed with the enamels) have either perished or have greatly suffered. But mosaics in enamel have been executed with considerable success by several eminent firms in this country. I may particularly mention some of the full-length figures in the principal hall of the museum at South Kensington, by Messrs. Rust & Co. and by Messrs. Harlow, Fisher, & Co. Some of the enamels used were, I am informed, produced in England, by Messrs. Powell, of Whitefriars; but the greater part were, I believe, obtained from abroad, mostly from St. Petersburg, where, as is well known, a manufactory of mosaic, which has produced some remarkable works, was founded by the Imperial Government, under the direction of Sig. Bonefede, a distinguished Roman mosaicist, who is only recently dead.

In Italy the traditions of the workers in mosaics have been handed down through centuries, and, although at times the art has been very low, and indeed was scarcely practised at all, yet it has never altogether died out in the Peninsula. At Monreale certain families of mosacists have been employed from generation to generation in keeping up and repairing the mosaics of the cathedral. At Rome, owing to the demand for elaborate mosaic in the reproduction of pictures, and for furniture and personal ornaments, the skill of the mosaicist was almost exclusively directed to those objects; but still the ancient traditions were not lost, and workmen were without difficulty found to execute the series of mosaics which adorn the walls of the new basilica of St. Paola. At Venice the old secrets were still preserved in the island of Murano, which had been celebrated since the twelfth and thirteenth centuries for the beauty of its manufactures in glass and for its enamels; but the sad condition to which the mosaic art had been reduced may be judged of by the restorations and renovations which during the last century and the early part of the present were executed in St. Mark's. A few years ago a poor glass-blower of Murano, named Lorenzo Radi, applied himself with that singular intelligence and perseverance which are not uncommon among Italian artists, to the improvement of the manufacture of enamel mosaics, and to the application of some of those secrets which were traditionally preserved in the island. He particularly turned his attention to the manufacture of gold mosaic. The success which attended his experiments attracted the attention of Dr. Salviati, a lawyer of Venice, and a gentleman of much ability and ingenuity, who perceived the value of his discoveries, and foresaw that they might be applied to the revival of mosaic decoration. He accordingly entered into an arrangement with Radi, and opened an establishment at Venice for mosaic work, and obtaining artists from Rome to instruct Venetian youths in this art. In former times mosaic work, having to be executed on the walls, required considerable time and labour, and was consequently very expensive. The mosaicist had to copy the cartoon on the wall itself, fixing the tesseræ one by one in the cement prepared to receive them. Dr. Salviati succeeded in avoiding the necessity of working on the spot by an ingenious process, which, however, is only applicable to decorative mosaic, and cannot be used where much delicacy of work and extreme nicety in the gradation of tints are required. He taught the workmen to execute the cartoon on the reverse side, the face of the mosaic being downwards. The tesseræ are fastened with common paste to sheets of coarse brown paper, on which the cartoon is traced. When the work is finished, it has only to be fixed with cement upon the wall destined to receive it, and the brown paper is then removed from the face of it. This process requires considerable skill and practice, especially when figures have to be executed, but is perfectly successful. Thus the decoration of many hundred square feet of surface can be forwarded from Venice to any part of the world—to America or to India, with safety and at little cost. Having thus found the means of executing mosaics in the establishment at Venice, and having trained a number of young Venetians to the art, and much improved the quality of his enamels, he endeavoured to introduce this mode of decoration into foreign countries. It was chiefly in England that he met with success. The increased feeling for colour and decoration, and the gradual improvement in the public taste which had taken place in this country, chiefly through the enlightened influence of the Prince Consort, were very favourable to his attempt. It was principally through the knowledge of art and the well-known taste of the Queen that Dr. Salviati obtained his first important commission,—the decoration of the Wolsey Chapel at Windsor, and that of the Albert Memorial in Hyde-park. The mosaics of the latter monument are now complete, and cover above 1,000 square feet. In the Wolsey Chapel very little now remains to be done. The general designs for the reproduction of mosaic decoration in both these monuments were by our distinguished fellow, Mr. Gilbert Scott, and were carried out under his directions from the cartoons of Mr. Clayton, of the firm of Clayton & Bell.

The Albert Memorial and Wolsey Chapel furnish excellent examples of mosaic used both for external and internal decoration. In the Albert Memorial mosaics adorn a pediment and two spandrels on each face, and the vaulting above the statue of the Prince. The four pediments are occupied by allegorical female figures on a gold ground, representing poetry, architecture, sculpture, and painting. Beneath each pediment, on two spandrels, are figures, also on a gold ground, illustrating the application of the art typified in the figure above. The vaulting is blue, set with gold stars, and adorned with emblazoned coats of arms. The general effect of the mosaics, as far as one can judge, in the present unfinished state of the monument, is rich and harmonious. Mr. Clayton has designed his cartoon with a thorough knowledge of the capabilities of mosaic, and of the requirements of architectural decoration. The figures are distinctly and clearly defined on gold ground, and can consequently be seen from a considerable distance. Except on the cathedral at Orvieto, there is no similar instance of the employment of mosaic on so large a scale for external decoration. The mosaics of the Albert Memorial, exposed to the full influence of our climate and atmosphere, and facing the four quarters of the heavens, will furnish the best test of the durability of the material when used in this country on the exterior of monuments.

If I am not much mistaken, the Wolsey Chapel, when completed, will prove the most gorgeous and perfect specimen of modern decoration in Europe. The intervals between the ribs of the groined roof, including an area of about 2,100 superficial feet, are adorned with angels, heraldic devices, and various ornaments in mosaic on a gold ground. The soffits of the twelve side windows are similarly ornamented, and the twenty-eight panels of the great blank west window are occupied by full-length figures of historic persons who have been connected with the erection of Windsor Castle, also in mosaic on a gold ground. The windows are filled with the richest stained glass by Messrs. Clayton & Bell. The walls of the chapel are panelled with a series of Scripture subjects in marble tarsia, each framed in bands of ornament formed by white marble reliefs inlaid in marbles of various colours, the whole executed by the Baron de Triqueti. The tarsia of coloured marbles and engraved outlines and shading filled with mastic is a revival and improvement by the Baron de Triqueti of an art practised during the Italian cinque-cento, and carried to its highest perfection at that time on the pavement of the *duomo* of Sienna. Above each panel are introduced medallion busts of the Queen and members of the Royal Family by Miss Durant, a pupil of the Baron de Triqueti. As the decoration of this chapel is not yet finished, the time is perhaps not come to pronounce a fixed opinion upon it; but I cannot refrain from saying how much impressed I have been with the exquisite and refined beauty, and at the same time with the exceeding richness of the general effect. I especially rejoice to see an example of interior decoration thoroughly carried out, and I cannot but believe that it will lead to still greater works of the same nature.

Besides the decoration of those monuments which I have described, Dr. Salviati has obtained other commissions for public buildings in England. In the Museum of South Kensington, he has executed several full-length figures of celebrated painters, sculptors, and other artists after cartoons by some of our most eminent painters. I may particularly mention the figures of Nicolas Pisano, by Mr. Leighton, and of Apelles, by Mr. Poynter. In Westminster Abbey, "The Last Supper," over the communion-table, is by him, after a design by Mr. Clayton. For St. Paul's he has executed the mosaics of two pendentives of the dome, one from a cartoon by Mr. Watts, the other from a cartoon by Mr. Rivers; and he has a contract for the decoration of the remaining pendentives. I trust that the day may come when the whole of the dome may be similarly decorated as the dome of St. Peter's at Rome is. The architect of the noble edifice, Mr. Penrose, has not, I hope, relinquished the idea of carrying out Sir Christopher Wren's original design. In addition to these great commissions, Dr. Salviati has executed several reredoses for churches in England, into which they have been introduced with excellent effect.

Abroad the principal commission obtained by Dr. Salviati is that for the complete restoration of the mosaics on the walls and in the pavement of St. Mark's at Venice, for which a contract has been entered into extending over fifteen years. Many of the cartoons of such designs as have fallen away from the cracking of the walls, owing to the subsidence of the foundations, have been preserved, and I trust that the restorations will be executed with such care,—indeed, with such reverential feeling,—that this grand and unique monument may in no wise lose its original character.

From what I have said there cannot, I think, be a doubt that mosaic, both pictorial and simply decorative, not only can be, but ought to be, employed in this country. I have shown that when protected from the effects of the atmosphere in the interior of buildings its durability can scarcely be questioned. With regard to exterior use, it may yet have to be tested; although I see no reason why it should not be proof against our climate, if proper precautions are taken in fixing it. These precautions consist mainly in the selection of the cement which binds the tesseræ together and fixes the mosaic to the wall. That used by Dr. Salviati has been subjected, I believe, to adequate tests by Mr. Gilbert Scott and other eminent architects who have employed mosaic, and has been found of excellent quality. The architects of St. Mark's appear at one time to have used as an additional precaution in fixing mosaics, especially on walls and ceilings, large nails with heads in the form of a star, and, as it were, split at the end, in which a wedge was inserted which opened up the nail as it was driven into the wall; but such precautions appear to be scarcely necessary when perforated bricks are employed for the reception of mosaic, and they do not appear to have been used by the most ancient mosaicists.

There is still another point of a practical nature upon which the architect and the public also will naturally require some information: I mean the question of cost. Upon this subject Mr. Digby Wyatt made some statements in his paper; but since then, owing to the greater facility of execution, and of producing certain enamels, the scale of prices has somewhat altered. The cost of mosaic depends principally upon the following considerations,—the quality of the work, the distance from the eye at which it is to be placed, the predominance of figures, ornament, or simple ground, and the prevalence of certain tints.

On the walls and on the table are various specimens of Venetian mosaic, which will afford some idea of the relative quality of work used for architectural decoration.*

The most elaborate, well-executed mosaic, for decoration in England, are the figures at South Kensington Museum. It would be difficult to find finer specimens of this branch of the art, but they are, of course, the most expensive, requiring very skilful artists, who receive very high pay. I doubt whether mosaic of this nature can ever be introduced very largely for purely decorative purposes. The great monuments of Italy and of the East contain no work so elaborate and highly finished.

* The illustrations referred to consisted of a mosaic picture representing a full-length figure of our Lord, from designs by Mr. Gambier Parry, exhibited at the Ruthin Exhibition; a mosaic picture representing Henry III., duplicate of one of the twenty-eight figures in the east window of the Wolsey Chapel at Windsor, by Salviati; a ditto of Henry VII.; and a mosaic picture representing Our Saviour at Supper with the Disciples at Emaus.

The pictorial mosaics of the Albert Memorial and of the Wolsey Chapel are purely decorative, and are meant to be seen from a distance. In order to be effective, they are not too fine in the workmanship or too elaborate in the gradations of tints. These figures are excellent examples of what mosaic for internal decoration should be; but they are more elaborate in execution and in gradation of colour than most of the decorative mosaics of the early Italian and Byzantine churches; although there are specimens in St. Mark's, as in the semi-dome over the exterior northern entrance in the Mascoli Chapel and in the sacristy, which exceed it in the fineness of the work and the smallness and exact fitting of the tesseræ. The figure of Christ in the act of blessing, from a cartoon by my friend Mr. Gambier Parry, an eminent amateur artist, is a good example of the two qualities of work united. The head having been executed by a skilful artist, according to the usual process, that is to say, not on the reverse; the drapery, by less skilled hands, on the reverse. Still coarser work even than any specimen exhibited here is well suited for simple architectural decoration and even for figures, producing an excellent effect when far removed from the eye,—a better effect, indeed, than more finely-executed work.

Of course, figures require, under all circumstances, more careful execution and more skilful workmen than mere ornament. As regards the relative cost of tints, the reds and purples are the most expensive, on account of the materials used in them, and of the difficulty of producing them. The gold mosaic, but especially the silver, which is more difficult to obtain than the gold, is more costly than common tints. To show the requirements of a mosaic establishment, I may mention, that in order to execute in a satisfactory manner the cartoons which have hitherto been confided to Dr. Salviati, a stock of nearly 1,500 tints has been brought together, for the most part produced on the company's premises at Murano. I may point out that any quality or tint of gold may be obtained by darkening or lightening the colour of the glass upon which the gold-leaf is laid, or by using a film of coloured instead of transparent glass over it; or the brightness of the gold may be deadened by roughing the surface of the outer film of glass with the wheel. The architect or painter can consequently choose the quality of gold which best suits his work or his taste.

Taking, the various qualities of mosaic which may be fitly used for decorative purposes, the price would vary from about 30s. the square foot to 4*l.* or, at the utmost, 5*l.* for the finest. This includes the fixing, but not, of course, the price of the cartoon. When these prices are compared with what an artist of eminence, and fully employed, would receive for the execution of a great fresco, or any elaborate mural decoration; in fact, with what the artists engaged on the wall-paintings in the Houses of Parliament have received, they will be found, I think, very moderate. Of course, we must take the cost of a cartoon into consideration; but even if this be added to the cost of the mosaic, supposing the cartoon to be executed by an artist of high reputation, the whole expense of the mosaic would be far less than that needed for the execution of an elaborate fresco by the same artist. It must be borne in mind that all great fresco-painters have, before commencing their work on the wall, executed most careful cartoons for it,—cartoons, indeed, which would be more than sufficient for the skilful mosaicist.

As regards simple decoration,—when the durability of the material, the facility with which it is cleaned and restored, and the admirable effect that it is calculated to produce, are taken into consideration, the price of mosaic is certainly not an obstacle in the way of its use on a large scale in our great public and even private buildings. In conclusion, I would venture to express a hope that the subject which I have brought before you this evening is one not unworthy of the attention of English architects, and that by the aid of mosaic we shall see erected public buildings which, in their internal decoration, as well as in their exterior architectural features, may be worthy of the wealth and greatness of the country.

LONDON OVER THE WATER.—There is scarcely a street in the district of St. Olave's, Southwark, where fever, in some form or other, is not raging, according to the *South London Press*.

ON THE DRYING PROPERTIES OF VARIOUS KINDS OF HOUSE PAINT.*

THE question we have to consider is, "Why does paint dry?"

The difficulties of this question presented themselves to me on the occasion of some house-painting during the last summer. "Capital weather for drying, sir," was the remark of the painter. "Why does paint dry?" was the question of a child.

I have great love and respect for children. I love them because they think what they say, and say what they think. I respect them because they are good observers, and continue to be so until they go to school and learn how not to observe. Philosophers are children whose powers of observation have been cultivated. Children left to themselves are philosophers: what a pity they should cease to be so.

But why does paint dry? When a shower of rain wets the pavement and the sun shines out and the wet disappears, we know that a certain amount of heat-force has converted the water into invisible vapour, and we call this process of drying evaporation. So, also, when we boil a kettle of water, there is a change of state, of water into steam, and a process of evaporation is going on, only in this case it is more rapid than in the other; and evaporation is not superficial merely, but from every part of the liquid, more or less. Continue the process, and the water dries up by this rapid evaporation. Again, if we apply heat to oil of turpentine contained in a retort, it will boil a little over 300° Fahr., and the vapour may be collected and condensed in a cooled receiver; but, if we try to boil linseed oil, for example, it will not only not distil over, but it will blacken and decompose instead of boil. If we moderate the heat so as not to carbonise it, then it will lose about one-sixth of its weight and become thick, tenacious, and viscid; forming what is called printer's varnish. Raise the temperature above 600°, and if air be present the oil will take fire and burn quietly without further external heating, until nothing but tar or charcoal is left. If, however, the burning be interrupted by closing the vessel, a brown viscid substance will be left, known as bird-lime.

There must be something, then, very different in the constitution of these two oils, turpentine and linseed, since they behave so differently under the influence of heat. Such is the case. Turpentine belongs to a class of oils known as *volatile;* that is, they can be raised into vapour by means of heat, and under certain conditions, will evaporate or dry up in the sense that the wet on the pavement dries up after a shower of rain. Linseed oil, on the other hand, which cannot be boiled or distilled, belongs to a class of oils called *fixed*.

Some one now steps in with an objection. Painters not only boil their linseed oil, but the very process gives the name of *boiled oil* to the product.

What painters really do is this: they gradually raise the oil to about 500°, when it begins to give off acrid vapours, and a little above 600° the oil itself begins to decompose with the escape of gaseous hydro-carbons, which, swelling up in bubbles, give the oil the appearance of boiling. Continue the process out of the reach of air, and the oil would be entirely broken up, past recall, into a mixture of solid and liquid hydro-carbons, and various fatty acids, with a very irritating body, known as *acrolein*, from its distressing action on the mucous membrane of the eyes and organs of respiration. It is quite clear, then, that the linseed or nut oil used as the liquid vehicle of paint does not dry by the ordinary process of evaporation. I put the question, "Why does paint dry?" to an intelligent painter, and the answer was, "Because we mix *dryers* with the paint." These dryers, as they are called, consist of litharge, oxide of manganese, and sugar of lead. Linseed oil is heated with about one-twentieth of its weight of litharge, which the oil completely dissolves, and is then used as a dryer. A similar heating with manganese or sugar of lead also improves the so-called drying properties of the oil.

But what would be the effect of omitting the dryers altogether in the composition of the paint? I have no doubt most painters would say that the paint would never dry. Let us see the result of a careful experiment performed by Chevreul some years ago. Of course, you are aware that house paint, omitting the colouring matters or stainers, consists of three ingredients: 1st, white lead or white zinc; 2nd, a fixed oil, such as linseed, or nut, used for the purpose of reducing the white to a soft paste, to which is afterwards added variable proportions of linseed or other oil for thinning the paint; 3rd, the drying material or dryer which we now propose to omit.

Four oak strips were painted, each on one side, with a paint composed of white lead and linseed oil, and the other side with a paint composed of white zinc and linseed oil. The strip No. 1 was exposed to the air to dry; No. 2 was put into a bottle of the capacity of two litres (3·52 pints) and closed; No. 3 was put into a similar bottle, containing dry oxygen gas; No. 4 was put into a similar bottle, containing dry carbonic acid gas. The results as to drying were examined after twenty-four hours, and again after seventy-two hours:—

After twenty-four hours.

No. 1. The lead paint was almost dry; the zinc paint had set, but was not dry. No. 2. The lead paint was almost dry; the zinc paint had set, but was not dry. No. 3. Both the lead and the zinc paints were perfectly dry. No. 4. Both paints were still wet and fresh, and had undergone no change.

After seventy-two hours.

Nos. 1 and 2. Both paints were perfectly dry. No. 4. The lead paint had almost set, but it had no adhesion to the wood, and could be easily removed by friction; the zinc paint had undergone no change, but stuck to the finger like fresh paint.

Now, how remarkable are these results. Paint, containing no so-called dryer, dries rapidly and completely in oxygen gas, within twenty-four hours, and does not dry at all in dry carbonic acid gas. It dries more slowly in the air, whether exposed or confined, and in another experiment it was shown that in drying in a confined volume of atmospheric air, the paint had absorbed all the oxygen, and left nothing but pure nitrogen in the bottle.

We can now answer the question, "Why does paint dry?" in a scientific, that is, in a satisfactory manner. Paint dries, not because it loses anything, as in the case of ordinary drying by evaporation, but because it absorbs oxygen from the air, and solidifies in combining with it. The drying of paint is not, therefore, a physical effect, as in the case of evaporation, but a chemical one, in which there is a change of properties attending a change of state from liquid or viscid to solid.

In the above experiments we omitted the dryers; what would be the effect if we left out the white lead or the white zinc, and exposed pure linseed oil to the air?

Linseed oil exposed to the air in thin layers dries up into the form of a resinous, transparent, moderately elastic mass resembling caoutchouc. This property of absorbing oxygen and gradually becoming solid, also applies to walnut, hemp, poppy, grapeseed, safflower, and some other oils, and hence such oils are termed drying oils. In undergoing this change these oils undergo slow combustion, and give off carbonic acid. Under certain conditions the drying oils absorb oxygen so quickly as to take fire, as when the cotton-wool, tow, &c., used in cleaning machinery is thrown aside, and has thus led to conflagrations.

The non-drying oils, as those that do not absorb oxygen, are rape, colza, olive, almond, and many animal oils. By exposure to air they become gradually changed, but in a different manner as compared with drying oils. They become rancid from the fermentation of the cellular substances of the plant or animal from which the oil was obtained. They lose their colour, and, to a certain extent, their fluidity, and acquire an acrid, disagreeable taste. Such oils are, of course, quite unfit for the purposes of the painter, although there is ground for suspicion that linseed oil is sometimes adulterated with a cheap fish oil, the result of which in the paint is to produce a disagreeable kind of stickiness which is all but permanent. While studying the cohesion figures of liquids some years ago I was anxious to procure a specimen of pure linseed oil. The specimens procured from oil warehouses gave different figures; but in the International Exhibition of 1862 there was a linseed-oil press at work. Here, I thought, is a splendid opportunity for getting a

* By Charles Tomlinson, F.R.S., read at the Society of Arts on Wednesday, December 9th.

specimen of pure linseed oil. "It must be pure," said the man, "for we make it before your face." He gave me a bottle of oil, and generously volunteered to give also a sample of the seed. To my surprise, on examining the linseed, I found it mixed with various other seeds to the extent of at least one-sixth. What hope, then, is there of obtaining pure linseed oil, and, consequently, good drying paint, if not only the oil is liable to adulteration, but the source of the oil itself is impure?

The distinguished chemist who does us the honour of taking the chair to-night, has been good enough to place at my disposal some recent results obtained by the Dutch chemist, Mulder, who drew some of the oils experimented on from good fresh seed in his own laboratory. According to Mulder, the difference between non-drying and drying oils arises from the presence of oleic acid in the latter. He compares drying oils to blood; they absorb oxygen and give off carbonic anhydride. To prove this in the case of linseed oil, fragments of pumice-stone were ignited, left to cool, and then put into a bottle, and the pumice was moistened with boiled linseed oil, the effect of boiling being to raise the oil into a state of greater activity. Air, previously deprived of carbonic anhydride, was next passed over the pumice, and then into a vessel containing baryta water, which, in a few minutes became turbid from the presence of carbonic acid, due to the slow combustion of the oil.

A pure linseed oil, drawn in the laboratory, was represented by the formula C 76·8 H 11·2 O 12. When made colourless by being passed through animal charcoal, its composition was not altered. Poppy oil, nut and hemp seed oil, were found to be similar in composition. The chief component of these oils, and probably of all drying oils, is a neutral fat known as linoleine. Linseed oil also contains the fatty bodies known as elaine, palmitine, and myristene. Poppy oil contains elaine, myristene, and laurine. Walnut the same, but rather less laurine. The mucilaginous matter said to exist in these oils, and to act as a ferment, was not found.

The ash of good linseed oil contained only one per cent. by weight.

In the so-called dry distillation of linseed oil, when carefully conducted, decomposition begins at 250° C (482° Fahr.); it yields acroleine, which, by partial oxidation, forms a certain quantity of acrylic acid, sebacylic acid, palmitinic acid, and myristinic acid, while the great bulk of the oil left in the retort is the anhydride of linoleic acid not unlike birdlime, or fused india-rubber. It is insoluble in ether. It is dark-coloured in the mass, but of a straw-yellow in thin layers, and very elastic. This is the basis of our printing inks. In preparing it, in practice, there is usually a great loss, from the application of too strong a heat, so that volatile hydro-carbons and even oil-gas are produced.

Linseed oil, by saporification, yields glycerine, linoleic acid, elainic acid, palmitinic acid, and myristinic acid.

100 parts, by weight, of several drying oils, yielded by saporification from 87·7° to 95·4° of fatty acids, dried at 100° C. Fresh linseed oil 95·4°, old walnut oils 87·7°.

Linoleine is readily saporified by means of a solution of basic acetate of lead, the effect being the same as boiling the oil with litharge, or red lead.

Pure linoleine is not disposed to become rancid. The drying oils become slowly rancid by changes produced in the other fatty bodies present, especially in the elaine.

Poppy and nut oils become much sooner rancid than linseed-oil, but in general, the drying oils become less rapidly rancid than the non-drying.

The acid compound of linoleine is linoleic acid. This is a colourless compound when pure, and it is very fluid at 14° C., and is not solidified at 18° C. Its specific gravity is 0·9206. It reddens litmus, and is soluble in alcohol and ether. When exposed to air in thin layers linoleic acid absorbs oxygen and turns red. This change is greatly promoted by the presence of bases. The lime and baryta salts of linoleic acid are soluble in boiling alcohol. The lime, zinc, copper, and lead salts are soluble in ether. The acid readily oxidises, yielding linoxic acid, a substance something like Venice turpentine; it is colourless, but becomes blood red by being exposed to the heat of boiling water, as also by contact with strong caustic alkalies and acids. The alkaline carbonates do not affect this acid in the same way. The change in colour is not accompanied by change in composition.

In the change produced by the exposure of linoleic acid to the air, a body known as linoxine is first formed, and some months elapse before the peculiar stickiness of the Venice turpentine-like body is formed. With raw linseed oil, however, the change takes place in about two weeks, with boiled oil in a few days. Linoxine is formed by the loss of one equivalent of the elements of water from linoxic acid. Linoxine is an important body, it being the chief compound resulting from the application of oil colours and paints. It is amorphous and somewhat elastic, like leather or gutta-percha. It is not hydroscopic. It is heavier than water, and is not soluble in water, alcohol, or ether; it swells up in chloroform and bisulphide of carbon. It is not affected by acetic acid or by dilute mineral acids. Caustic alkalies dissolve it and turn it red, and it is precipitated from those solutions without change. The best solvent for linoxine is a mixture of chloroform and strong spirits of wine, aided by a moderate heat. Oil of turpentine renders it gelatinous, but does not dissolve it. It is not affected by being raised to 100° C., only it gets a little darker. It cannot be fused without decomposition. Such are Mulder's results, very briefly stated. They ought to have a marked effect not only on the practice of the house-painter, but also on that of the printers' ink maker. Chevreul's details also are full of practical instruction, and we now proceed to lay them before you.

Roughly speaking, the setting of paint is due to the absorption of oxygen; hence we can understand why the painters, in order to prevent their brushes from getting hard, put them into water when they leave off work; and also cover a painted surface with water when they want to keep the paint from setting.

We have spoken of white lead, or white zinc, as the basis of paint; white antimony has also been proposed. In order to determine the relative merits of the three, M. Chevreul instituted an experiment, in which 10 grammes (154 grains) of pure linseed oil were mixed up with sufficient quantities of the three solids without the addition of any dryer. It was found that the zinc paint covered a less surface than the lead, but more than the antimony paint. The drying of the different coats of the three paints required very different times, as will be seen in the following table:—

Coats.	Lead Paint.	Zinc Paint.	Antimony Paint.
	Days.	Days.	Days.
First	4	18	50
Second	3½	15	28
Third	3	5	27
Total	10½	38	105

Hence it appears that lead paint dries much more quickly than zinc or antimony paint. Indeed, unless it were possible to hasten the drying of zinc paint by the addition of a dryer, zinc paint would be of very little use in industry, since the practice of house painting requires that not more than two or three days shall elapse between the application of the first coat and that of the second.

Antimony paint is also too slow in drying to be used. A tin paint was also tried, but the oxide of tin was found to delay the drying of the oil. Pure linseed oil dries more quickly on glass than when mixed with oxide of antimony, so that this oxide is actually anti-siccative relatively to glass.*

* The conclusion in our next.

THE VALUE OF ASPHALTE.

The newspapers have quoted very extensively—and as if an entirely new thought—a recommendation by Professor Rolleston, of Oxford, to the effect that the entire area occupied by a house should be covered with "the same layer of impervious material which is put into the walls as the so-called 'damp course.' Such a superficial stratum may be cheaply made," the writer continued, "by a mixture of gravel and gas tar. It would effectually prevent that rising of watery vapour out of the soil which the 'aspiring' effect of a warm house does much to intensify over the area it covers." The suggestion, as many of our readers must know, is by no means new. Such a precaution, especially on clayey and otherwise damp soils, we have ourselves often adopted. For years past, in damp situations, all the areas of gunpowder magazines have been covered with Pyrimont asphalte, for the suppression of moisture. As long ago as 1853, Mr. William Rutson, of Newby Wiske, erected infant schools upon his estate, the entire site of which, with a view to sanitary benefits, was covered in the same manner; and over which the wooden floor was placed. In 1856, the whole of the foundations of the Enfield small arms factory and engine-houses, situated alongside the River Lea, had all their foundations encased with asphalte, by which means this portion of the building, though *surrounded at all times by 3 ft. of water*, has been ever since spotless from damp; so, also, the superintendent's house and offices at Pyrimont-wharf, Cubitt Town, by the recommendation of Messrs. Tillott & Chamberlain, architects, was thus prepared for. At Dr. Swabey's mansion, at Langley Marsh, near Slough, the area was thus covered under the direction of Mr. Hardwick. Again, in 1867, from 4 ft. to 5 ft. of water were kept out in the cellars and basement of Mr. Angell's, Lubenham, near Market Harborough, by the application of this same asphalte, under the direction of Messrs. Cubitt & Co. This same firm, during the erection of the new tobacco stores, in Victoria Docks, situated some 15 ft. or more below the basin of it, encased the dock front of the building with asphalte to the extent of 12,000 ft., continued it through the walls (7 ft. at ground line), and over the entire area of the floor to the further extent of 82,000 ft. Still it is so important that the worth of an impervious layer over the site of a building should be kept in view, that we are thankful to the professor for giving increased publicity to it. He was led to do so, it seems, by the assertion by Professor L. Pfeiffer, "that the interposition of a layer of impervious substance, of whatever kind so that it be impervious, between the level of the *ground-water* in the soil and the floor of a house built upon it, confers upon such house an immunity in cholera epidemics. Barracks and hospitals lying low, and on superficially placed strata of clay, have been remarked to remain free from attacks of this disease, whilst houses placed on elevated and sandy soils, and more favourably conditioned thus, probably, as to bronchitis and rheumatism, have enjoyed no such freedom."

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URBAN AND SUBURBAN RAILWAYS AND STREET TRAFFIC.

NEW remedies of various kinds are again proposed, by private Bills to be petitioned for in next session, for the growing evil, in the metropolis especially, of a street traffic in excess of the capabilities of the channels in which it has to be conducted. The remedies are of two classes.

One class of remedy applies to the regulation of the traffic, and to expedients for getting more work more quickly and safely out of the existing means of communication between one locality and another, by guiding the streams of traffic in accordance with understood municipal regulations enforced by law. Much has been well done by the police authorities in this respect, of which no better illustration can be given, perhaps, than the enormously-increased capabilities of London Bridge by the simple expedient of enforcing a quick and a slow stream of vehicular traffic in each direction,—a regulation that almost entirely obviated the numerous distressing and costly "blocks" that were of daily occurrence.

Another proposed remedy belonging to this class is the adoption of street tramways, by which a larger number of passengers could be carried at greater speed and in a smaller number of vehicles than by the ordinary street carriages in use. For tramways in the heart of London the public are not prepared as yet, and no projector is bold enough to propose their adoption for the City proper, the Strand, Oxford-street, or others of the main traffic arteries; but their use as suburban means of communication would, it may reasonably be expected, prove of public advantage in various respects,—in the increased celerity, smoothness, and comfort of this mode of locomotion as compared with the ordinary street omnibus, and especially in their operation as a check upon the railway companies in their dealings with suburban season ticket-holders. Acts for tramway systems have already been passed by Parliament for Liverpool and Dublin, the Liverpool ways to be carried into the very heart of the town and its best streets. The promoters of the Liverpool and Dublin Tramway Bills have petitioned for several sessions for the conversion of their "Metropolitan Tramways" Bill into an Act, but hitherto they have petitioned without success. This year they come forward again, with a somewhat smaller scheme than those of former years. They ask for less aggregate mileage, and propose to commence at points further from the more crowded thoroughfares in or near the heart of the City. Their proposed lines are to the north, two lines by leading thoroughfares; and to Stratford and Bow in the east, by Whitechapel and Mile-end. Other two Bills are to be brought forward for very large tramway schemes in various suburban localities.

The other class of remedies for the overgrown and ever-growing street traffic is by attempting its depletion or diversion into additional and new channels. To this end underground and overground railways are proposed, which often, in the first instance by breaking up the streets and interrupting existing traffic, aggravate to an almost intolerable extent the evils they are intended ultimately to abate. Some of the new schemes proposed for railways in London are but little obnoxious to this objection. One of these is a tunnel line, nearly four miles in length, proposed to be constructed between London Bridge and Clapham-common. This line, it is proposed, shall be under the highway between one terminus and the other, and will be strictly underground all the way. It can be made, it is alleged, without tearing up the road, or disturbing the ordinary traffic, excepting at the points where the shafts necessary for ventilation will be placed. The line will be practically straight and level nearly throughout. Whether with one aboveground line from London Bridge to Clapham, and another between the Borough-road and the Elephant and Castle and Clapham, a third and underground line will pay, is a question for speculators and investors to consider. Another line, under covered way, is proposed, which seems calculated to relieve the pressure upon the streets in a quarter—Billingsgate—which greatly needs relief. This is a line projected from Tower Hill, and along the north bank of the river to Blackfriars Bridge. An extension to Smithfield is also included in the plan, which embraces, moreover, the widening of Lower Thames-street, and the construction of a new road between London Bridge and Billingsgate Market. It is suggested that this line may be a good substitute for this portion of the Metropolitan District Railway, part of the inner circle, between Tower Hill and Blackfriars, and it is further suggested that the low-level main sewer may be carried along in the proposed embankment at a saving of 100,000*l.* as compared with the more inland course. The adoption of this suggestion would also avoid the necessity for breaking up the streets. Another very important underground line,—the Mid-London,—involving enormous cost, is proposed again,—its course to be from the Marble Arch under Oxford-street and Holborn to Newgate-street and Cheapside. Two lines are proposed to Islington,—the one an underground line from the Metropolitan line near Granville-square, Clerkenwell; the other an overground line, on viaduct all the way, as already mentioned by us, from Finsbury to the Agricultural Hall. The viaduct line, it is proposed, shall be on a 3-ft. gauge. Amongst the other lines affecting London and its suburbs is the Metropolitan Southern District, from the Elephant and Castle to Scotland-yard. This project, if the Bill passes, will absorb the Waterloo and Whitehall, and in the communication between the banks of the Thames the works of that company, in so far as they are available, will be taken advantage of.

FREE LIBRARIES.*

THE chief librarian of the Manchester Free Libraries, Dr. Crestadoro, has prepared his annual report for the library committee, who have presented it to the City Council. From this report it appears that the aggregate issues have been 807,664, against 673,432 in the preceding year, being an increase of 136,232. Out of this number, 262,446 volumes were issued in the reading-room of the Reference Library; 94,602 volumes in the reading-rooms attached to the branch libraries; and the remaining 452,616 volumes were lent to borrowers. The number of borrowers has amounted to 32,106. The number of books lost or damaged has fallen from 87 to 81, all replaced or paid for principally by borrowers, the guarantor's responsibility having been taxed in but few cases. The new regulation allows books to be taken out on the signature of one guarantor only. With reference to the borrowers' occupations and descriptions, 117 are clergymen, ministers, and missionaries; 1,066 represent literary men, architects, surgeons, solicitors, sculptors, artists, civil engineers, and other liberal professions; 462 are schoolmasters and schoolmistresses; 3,575 school boys and school girls; 3,443 merchants, traders, and agents; 229 employers of manufacturing, agricultural, and other industrial labour; 10,850 artisans, mechanics, working men, and labourers; 5,245 engaged in various public and private situations; and 3,250 ladies.

The Bebington Free Library was established on January 1st, 1866, by Mr. Joseph Mayer, of Liverpool. The number of books issued from it in 1866 was 12,199, to 700 readers. The number of books issued in 1867 was 25,993 to 1,350 readers. From January to April, 1868, the number of books issued was 7,032 to 1,473 readers. The number of volumes in the library was 11,703.

HER MAJESTY'S THEATRE, LONDON.

WITH the assistance of the architect, Mr. Lee, we publish the plan of the new Opera House, and by the side of it a plan of the old one, showing, amongst other things, that a considerable addition has been made to the stage and its surroundings. The following references show the appropriation of the various parts:—

THE LATE THEATRE.

A. Dressing-rooms.
B. Gallery entrance, &c., stairs to amphitheatre, &c., amphitheatre stalls.
C. Stage entrance.
D. Housekeeper.
E. Treasury.
F. Manager's room.
G. Box office.
H. Royal entrance.
I. Committee-room.
J. Entrance to stage.
K. Omnibus boxes.
L. Stairs to flies.

THE NEW THEATRE.

A. Stairs to amphitheatre.
B. Stairs to amphitheatre stalls.
C. Stairs of communication between tiers of boxes.
D. Cheque-taker.
E. Soldiers' room.
F. Acting manager's room.
G. Conductor's room.
H. Royal entrance and stairs.
I. Open areas.
J. Box office.
K. Manager's room.
L. Treasury.
M. Waiting-room.
N. Stage entrance.
O. Scenery entrance.
P. Green-room.
Q. Dressing-room.
R. Stairs to stage.
S. Stairs to dressing-rooms and carpenter's shop.
T. Ditto.
U. Stairs to stalls.
V. Stairs to pit.
W. Waterclosets, &c.
X. Stairs to pit tier of boxes.
Y. Stairs to flies.

The dimensions of the new house run thus:—

	ft.	in.
Height from pit-floor to the ceiling in the centre	63	0
Height from the stage to the roof over it	70	0
Height of basement under the stage	24	0
Length from back of stage to curtain	52	3
Length from curtain to the front of the boxes in centre	70	0
Diameter of curve of boxes on pit tier	56	0

The proscenium when finished will be 40 ft. in width, by 36 ft. in height.

* Sixteenth Annual Report to the Council of the City of Manchester on the Working of the Public Free Libraries, 1867-68. Bebington Free Library.

specimen of pure linseed oil. "It must be pure," said the man, "for we make it before your face." He gave me a bottle of oil, and generously volunteered to give also a sample of the seed. To my surprise, on examining the linseed, I found it mixed with various other seeds to the extent of at least one-sixth. What hope, then, is there of obtaining pure linseed oil, and, consequently, good drying paint, if not only the oil is liable to adulteration, but the source of the oil itself is impure?

The distinguished chemist who does us the honour of taking the chair to-night, has been good enough to place at my disposal some recent results obtained by the Dutch chemist, Mulder, who drew some of the oils experimented on from good fresh seed in his own laboratory. According to Mulder, the difference between non-drying and drying oils arises from the presence of oleic acid in the latter. He compares drying oils to blood; they absorb oxygen and give off carbonic anhydride. To prove this in the case of linseed oil, fragments of pumice-stone were ignited, left to cool, and then put into a bottle, and the pumice was moistened with boiled linseed oil, the effect of boiling being to raise the oil into a state of greater activity. Air, previously deprived of carbonic anhydride, was next passed over the pumice, and then into a vessel containing baryta water, which, in a few minutes became turbid from the presence of carbonic acid, due to the slow combustion of the oil.

A pure linseed oil, drawn in the laboratory, was represented by the formula C 76·8 H 11·2 O 12. When made colourless by being passed through animal charcoal, its composition was not altered. Poppy oil, nut and hemp seed oil, were found to be similar in composition. The chief component of these oils, and probably of all drying oils, is a neutral fat known as linoleine. Linseed oil also contains the fatty bodies known as elaine, palmitine, and myristene. Poppy oil contains elaine, myristene, and laurine. Walnut the same, but rather less laurine. The mucilaginous matter said to exist in these oils, and to act as a ferment, was not found.

The ash of good linseed oil contained only one per cent. by weight.

In the so-called dry distillation of linseed oil, when carefully conducted, decomposition begins at 250° C (482° Fahr.); it yields acroleine, which, by partial oxidation, forms a certain quantity of acrylic acid, sebacylic acid, palmitinic acid, and myristinic acid, while the great bulk of the oil left in the retort is the anhydride of linoleic acid not unlike birdlime, or fused india-rubber. It is insoluble in ether. It is dark-coloured in the mass, but of a straw-yellow in thin layers, and very elastic. This is the basis of our printing inks. In preparing it, in practice, there is usually a great loss, from the application of too strong a heat, so that volatile hydro-carbons and even oil-gas are produced.

Linseed oil, by saponification, yields glycerine, linoleic acid, elainic acid, palmitinic acid, and myristinic acid.

100 parts, by weight, of several drying oils, yielded by saponification from 87·7° to 95·4° of fatty acids, dried at 100° C. Fresh linseed oil 95·4°, old walnut oils 87·7°.

Linoleine is readily saponified by means of a solution of basic acetate of lead, the effect being the same as boiling the oil with litharge, or red lead.

Pure linoleine is not disposed to become rancid. The drying oils become slowly rancid by changes produced in the other fatty bodies present, especially in the elaine.

Poppy and nut oils become much sooner rancid than linseed-oil, but in general, the drying oils become less rapidly rancid than the non-drying.

The acid compound of linoleine is linoleic acid. This is a colourless compound when pure, and it is very fluid at 14° C., and is not solidified at 18° C. Its specific gravity is 0·9206. It reddens litmus, and is soluble in alcohol and ether. When exposed to air in thin layers linoleic acid absorbs oxygen and turns red. This change is greatly promoted by the presence of bases. The lime and baryta salts of linoleic acid are soluble in boiling alcohol. The lime, zinc, copper, and lead salts are soluble in ether. The acid readily oxidises, yielding linoxic acid, a substance something like Venice turpentine; it is colourless, but becomes blood red by being exposed to the heat of boiling water, as also by contact with strong caustic alkalies and acids. The alkaline carbonates do not affect this acid in the same way. The change in colour is not accompanied by change in composition.

In the change produced by the exposure of linoleic acid to the air, a body known as linoxine is first formed, and some months elapse before the peculiar stickiness of the Venice turpentine-like body is formed. With raw linseed oil, however, the change takes place in about two weeks, with boiled oil in a few days. Linoxine is formed by the loss of one equivalent of the elements of water from linoxic acid. Linoxine is an important body, it being the chief compound resulting from the application of oil colours and paints. It is amorphous and somewhat elastic, like leather or gutta-percha. It is not hydroscopic. It is heavier than water, and is not soluble in water, alcohol, or ether; it swells up in chloroform and bisulphide of carbon. It is not affected by acetic acid or by dilute mineral acids. Caustic alkalies dissolve it and turn it red, and it is precipitated from those solutions without change. The best solvent for linoxine is a mixture of chloroform and strong spirits of wine, aided by a moderate heat. Oil of turpentine renders it gelatinous, but does not dissolve it. It is not affected by being raised to 100° C., only it gets a little darker. It cannot be fused without decomposition. Such are Mulder's results, very briefly stated. They ought to have a marked effect not only on the practice of the house-painter, but also on that of the printers' ink maker. Chevreul's details also are full of practical instruction, and we now proceed to lay them before you.

Roughly speaking, the setting of paint is due to the absorption of oxygen; hence we can understand why the painters, in order to prevent their brushes from getting hard, put them into water when they leave off work; and also cover a painted surface with water when they want to keep the paint from setting.

We have spoken of white lead, or white zinc, as the basis of paint; white antimony has also been proposed. In order to determine the relative merits of the three, M. Chevreul instituted an experiment, in which 10 grammes (154 grains) of pure linseed oil were mixed up with sufficient quantities of the three solids without the addition of any dryer. It was found that the zinc paint covered a less surface than the lead, but more than the antimony paint. The drying of the different coats of the three paints required very different times, as will be seen in the following table:—

Coats.	Lead Paint.	Zinc Paint.	Antimony Paint.
	Days.	Days.	Days.
First	4	18	50
Second	3½	15	28
Third	3	5	27
Total	10½	38	105

Hence it appears that lead paint dries much more quickly than zinc or antimony paint. Indeed, unless it were possible to hasten the drying of zinc paint by the addition of a dryer, zinc paint would be of very little use in industry, since the practice of house painting requires that not more than two or three days shall elapse between the application of the first coat and that of the second.

Antimony paint is also too slow in drying to be used. A tin paint was also tried, but the oxide of tin was found to delay the drying of the oil. Pure linseed oil dries more quickly on glass than when mixed with oxide of antimony, so that this oxide is actually anti-siccative relatively to glass.*

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NEW remedies of various kinds are again proposed, by private Bills to be petitioned for in next session, for the growing evil, in the metropolis especially, of a street traffic in excess of the capabilities of the channels in which it has to be conducted. The remedies are of two classes.

One class of remedy applies to the regulation of the traffic, and to expedients for getting more work more quickly and safely out of the existing means of communication between one locality and another, by guiding the streams of traffic in accordance with understood municipal regulations enforced by law. Much has been well done by the police authorities in this respect, of which no better illustration can be given, perhaps, than the enormously-increased capabilities of London Bridge by the simple expedient of enforcing a quick and a slow stream of vehicular traffic in each direction,—a regulation that almost entirely obviated the numerous distressing and costly "blocks" that were of daily occurrence.

Another proposed remedy belonging to this class is the adoption of street tramways, by which a larger number of passengers could be carried at greater speed and in a smaller number of vehicles than by the ordinary street carriages in use. For tramways in the heart of London the public are not prepared as yet, and no projector is bold enough to propose their adoption for the City proper, the Strand, Oxford-street, or others of the main traffic arteries; but their use as suburban means of communication would, it may reasonably be expected, prove of public advantage in various respects,—in the increased celerity, smoothness, and comfort of this mode of locomotion as compared with the ordinary street omnibus, and especially in their operation as a check upon the railway companies in their dealings with suburban season ticket-holders. Acts for tramway systems have already been passed by Parliament for Liverpool and Dublin, the Liverpool ways to be carried into the very heart of the town and its best streets. The promoters of the Liverpool and Dublin Tramway Bills have petitioned for several sessions for the conversion of their "Metropolitan Tramways" Bill into an Act, but hitherto they have petitioned without success. This year they come forward again, with a somewhat smaller scheme than those of former years. They ask for less aggregate mileage, and propose to commence at points further from the more crowded thoroughfares in or near the heart of the City. Their proposed lines are to the north, two lines by leading thoroughfares; and to Stratford and Bow in the east, by Whitechapel and Mile-end. Other two Bills are to be brought forward for very large tramway schemes in various suburban localities.

The other class of remedies for the overgrown and ever-growing street traffic is by attempting its depletion or diversion into additional and new channels. To this end underground and overground railways are proposed, which often, in the first instance by breaking up the streets and interrupting existing traffic, aggravate to an almost intolerable extent the evils they are intended ultimately to abate. Some of the new schemes proposed for railways in London are but little obnoxious to this objection. One of these is a tunnel line, nearly four miles in length, proposed to be constructed between London Bridge and Clapham-common. This line, it is proposed, shall be under the highway between one terminus and the other, and will be strictly underground all the way. It can be made, it is alleged, without tearing up the road, or disturbing the ordinary traffic, excepting at the points where the shafts necessary for ventilation will be placed. The line will be practically straight and level nearly throughout. Whether with one aboveground line from London Bridge to Clapham, and another between the Borough-road and the Elephant and Castle and Clapham, a third and underground line will pay, is a question for speculators and investors to consider. Another line, under covered way, is proposed, which seems calculated to relieve the pressure upon the streets in a quarter—Billingsgate—which greatly needs relief. This is a line projected from Tower Hill, and along the north bank of the river to Blackfriars Bridge. An extension to Smithfield is also included in the plan, which embraces, moreover, the widening of Lower Thames-street, and the construction of a new road between London Bridge and Billingsgate Market. It is suggested that this line may be a good substitute for this portion of the Metropolitan District Railway, part of the inner circle, between Tower Hill and Blackfriars, and it is further suggested that the low-level main sewer may be carried along in the proposed embankment at a saving of 100,000*l.* as compared with the more inland course. The adoption of this suggestion would also avoid the necessity for breaking up the streets. Another very important underground line,—the Mid-London,—involving enormous cost, is proposed again,—its course to be from the Marble Arch under Oxford-street and Holborn to Newgate-street and Cheapside. Two lines are proposed to Islington,—the one an underground line from the Metropolitan line near Granville-square, Clerkenwell; the other an overground line, on viaduct all the way, as already mentioned by us, from Finsbury to the Agricultural Hall. The viaduct line, it is proposed, shall be on a 3-ft. gauge. Amongst the other lines affecting London and its suburbs is the Metropolitan Southern District, from the Elephant and Castle to Scotland-yard. This project, if the Bill passes, will absorb the Waterloo and Whitehall, and in the communication between the banks of the Thames the works of that company, in so far as they are available, will be taken advantage of.

FREE LIBRARIES.*

THE chief librarian of the Manchester Free Libraries, Dr. Crestadoro, has prepared his annual report for the library committee, who have presented it to the City Council. From this report it appears that the aggregate issues have been 807,664, against 673,432 in the preceding year, being an increase of 136,232. Out of this number, 262,446 volumes were issued in the reading-room of the Reference Library; 94,602 volumes in the reading-rooms attached to the branch libraries; and the remaining 452,616 volumes were lent to borrowers. The number of borrowers has amounted to 32,106. The number of books lost or damaged has fallen from 87 to 81, all replaced or paid for principally by borrowers, the guarantor's responsibility having been taxed in but few cases. The new regulation allows books to be taken out on the signature of one guarantor only. With reference to the borrowers' occupations and descriptions, 117 are clergymen, ministers, and missionaries; 1,066 represent literary men, architects, surgeons, solicitors, sculptors, artists, civil engineers, and other liberal professions; 462 are schoolmasters and schoolmistresses; 3,575 school boys and school girls; 3,443 merchants, traders, and agents; 229 employers of manufacturing, agricultural, and other industrial labour; 10,850 artisans, mechanics, working men, and labourers; 5,245 engaged in various public and private situations; and 3,250 ladies.

The Bebington Free Library was established on January 1st, 1866, by Mr. Joseph Mayer, of Liverpool. The number of books issued from it in 1866 was 12,199, to 700 readers. The number of books issued in 1867 was 25,993 to 1,350 readers. From January to April, 1868, the number of books issued was 7,032 to 1,473 readers. The number of volumes in the library was 11,703.

* Sixteenth Annual Report to the Council of the City of Manchester on the Working of the Public Free Libraries, 1867-68. Bebington Free Library.

HER MAJESTY'S THEATRE, LONDON.

WITH the assistance of the architect, Mr. Lee, we publish the plan of the new Opera House, and by the side of it a plan of the old one, showing, amongst other things, that a considerable addition has been made to the stage and its surroundings. The following references show the appropriation of the various parts:—

THE LATE THEATRE.

A. Dressing-rooms.
B. Gallery entrance, &c., stairs to amphitheatre, &c., amphitheatre stalls.
C. Stage entrance.
D. Housekeeper.
E. Treasury.
F. Manager's room.
G. Box office.
H. Royal entrance.
I. Committee-room.
J. Entrance to stage.
K. Omnibus boxes.
L. Stairs to flies.

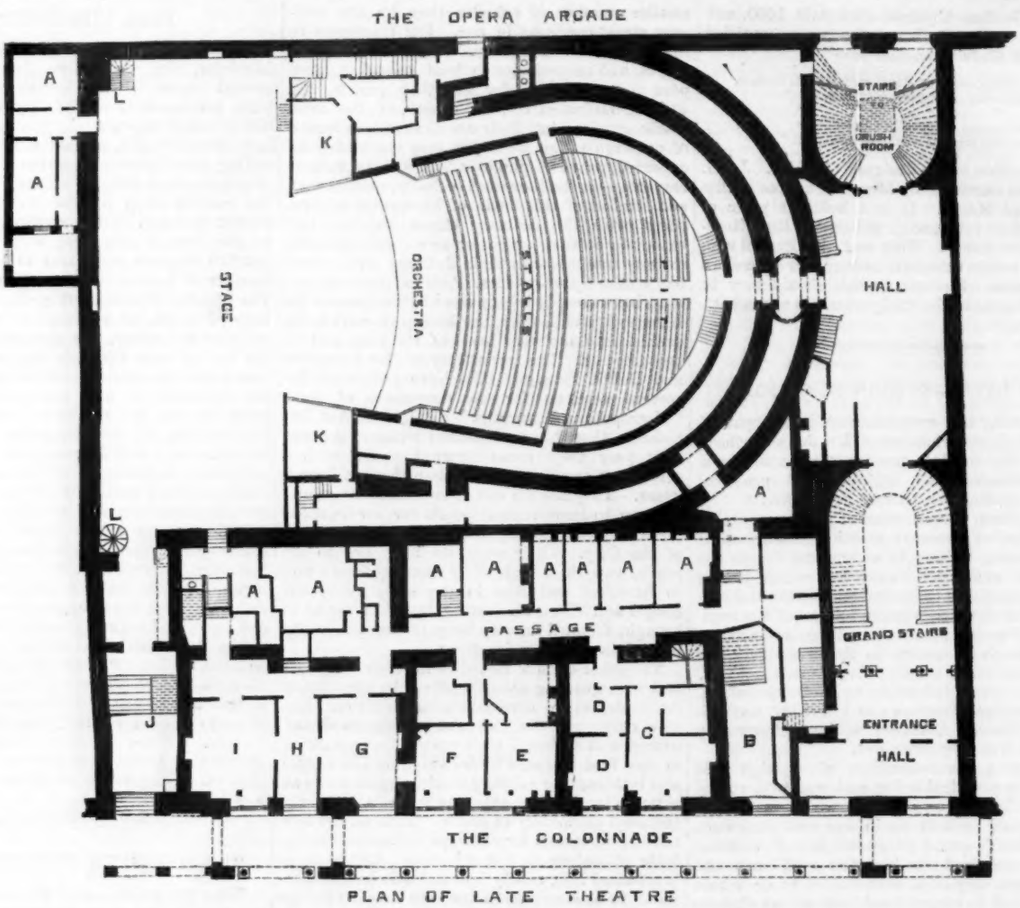
THE NEW THEATRE.

A. Stairs to amphitheatre.
B. Stairs to amphitheatre stalls.
C. Stairs of communication between tiers of boxes.
D. Cheque-taker.
E. Soldiers' room.
F. Acting manager's room.
G. Conductor's room.
H. Royal entrance and stairs.
I. Open areas.
J. Box office.
K. Manager's room.
L. Treasury.
M. Waiting-room.
N. Stage entrance.
O. Scenery entrance.
P. Green-room.
Q. Dressing-room.
R. Stairs to stage.
S. Stairs to dressing-rooms and carpenter's shop.
T. Ditto.
U. Stairs to stalls.
V. Stairs to pit.
W. Watercloseta, &c.
X. Stairs to pit tier of boxes.
Y. Stairs to flies.

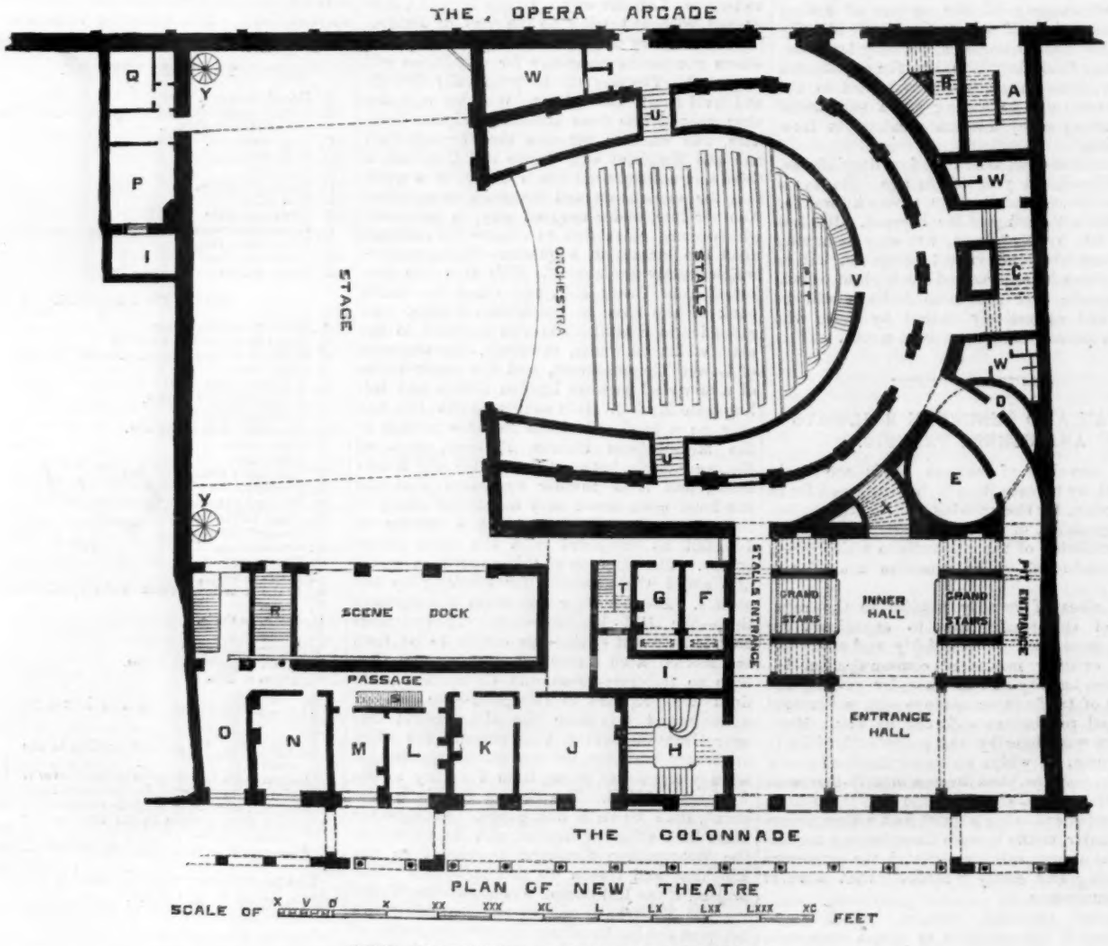
The dimensions of the new house run thus:—

	ft.	in.
Height from pit-floor to the ceiling in the centre	63	0
Height from the stage to the roof over it	70	0
Height of basement under the stage	24	0
Length from back of stage to curtain	52	3
Length from curtain to the front of the boxes in centre	70	0
Diameter of curve of boxes on pit tier	56	0

The proscenium when finished will be 40 ft. in width, by 36 ft. in height.

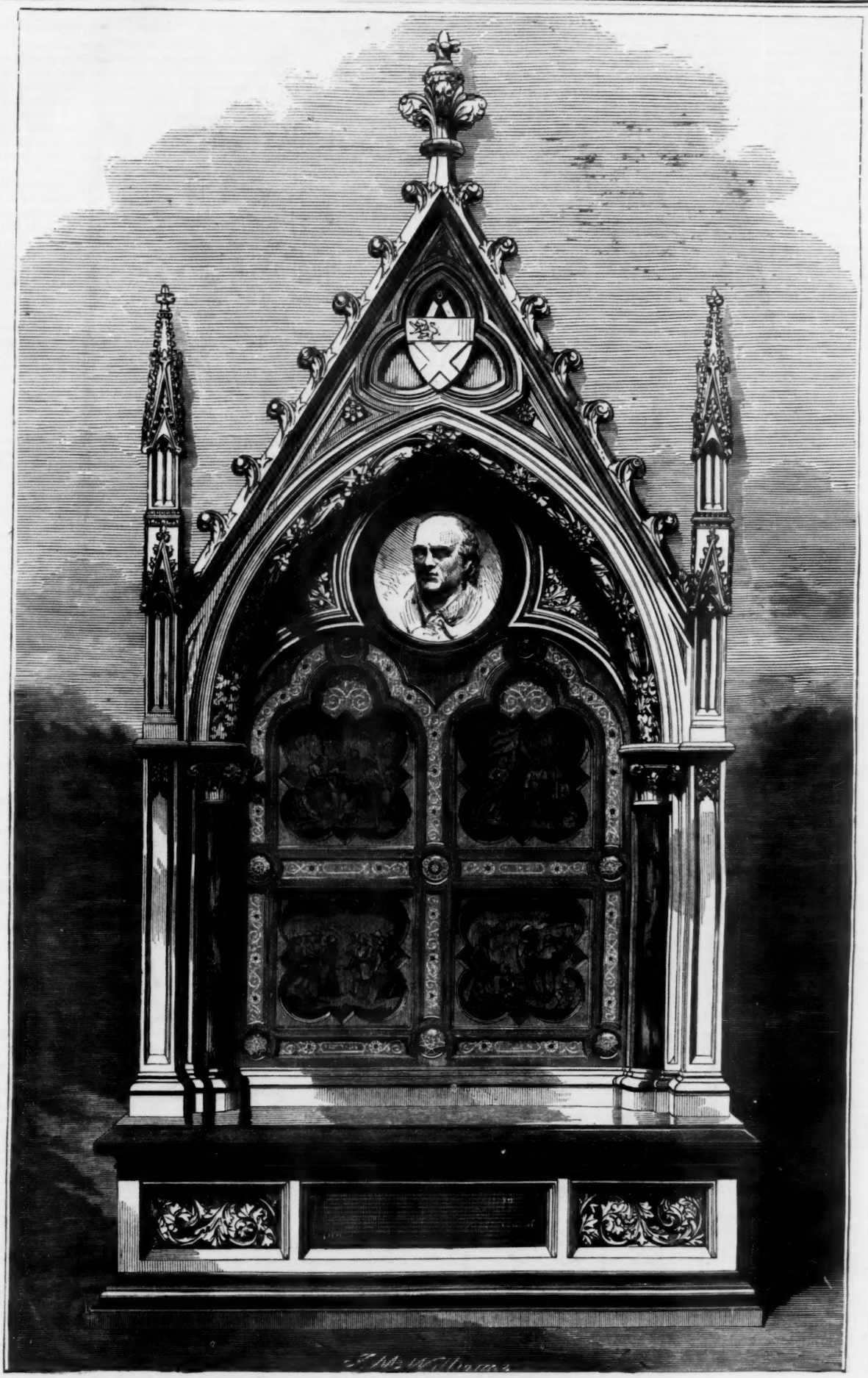


PLAN OF LATE THEATRE



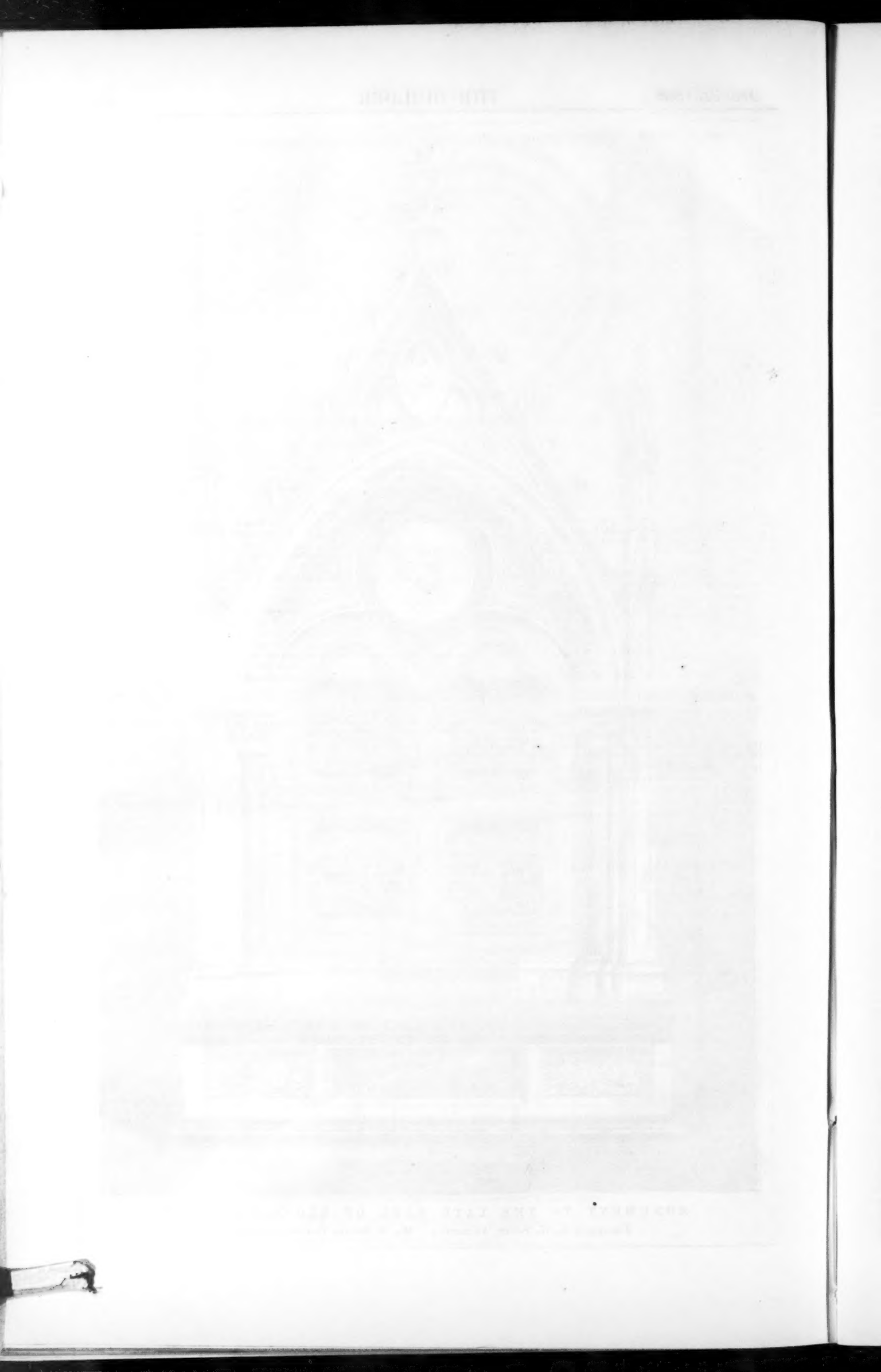
PLAN OF NEW THEATRE

HER MAJESTY'S THEATRE, LONDON.



MONUMENT TO THE LATE EARL OF ELGIN, CALCUTTA.

PROFESSOR G. G. SCOTT, ARCHITECT. MR. J. BIRNIE PHILIP, SCULPTOR.



MONUMENT TO THE LATE LORD ELGIN.

THE monument of which we here give an illustration is destined for the cathedral of Calcutta, and has been executed at the expense of the Government, in memory of the services of the Earl of Elgin and Kincardine. The design is by Professor G. G. Scott, R.A., and the monument has been executed by Mr. J. Birnie Philip, of Hans-place, in a manner quite worthy of that gentleman's distinguished reputation. To describe the work somewhat in detail: it is a mural monument, Italian Gothic in style, raised upon a table, or rather semi-table. The general form or body is a pedimented parallelogram. On each side is a panelled buttress with crocketed pinnacle, the pediment being richly crocketed also, and terminating with a finial. The centre of the whole is divided into four by broad bands, the upper two divisions being trefoiled. Above these panels is a circular frame in dark marble, in which is an alto-relievo portrait of Lord Elgin, in pure white marble. The four panels each contain a subject in bronze, depicting some prominent event in the diplomatic career of the late earl in the four countries where he had served. The bands which divide these panels are dove-coloured Derbyshire marble, enriched with incised gilded scroll-work, and at intervals studded with jewels, as they are termed. Eight bosses of rich-coloured marble occur at the intersections of the bands and tops of the arches. Over the panels and within the pediment is a trefoiled pointed arch, sculptured with small figures, portraying the virtues of a good governor, and springing from a marble column on each side. The spandrels formed by the trefoil, and which enclose the portrait, are filled with highly-wrought foliage; indeed, the whole is worked as if in ivory rather than stone. A dark serpentine slab covers the table, and the same material forms the base. The front of the table contains the inscription, and has two panels decorated with foliage somewhat too purely Italian in design. The body of the monument is of Mansfield Woodhouse stone. The columns on each side are of greenish-coloured marble. As a whole the monument may be said to harmonise well in tint, with the exception of the marble portrait relievo, which is at present over-white.

The inscription runs thus:—

"In Memory of the Right Honble. JAMES BRUCE,
Earl of Elgin and Kincardine, K.T., G.M.S.I., G.C.B.,
Viceroy and Governor-General of India,
Who Died, in the execution of his office,
At Dhurmsala, in Northern India, and there lies Buried,
This Monument is erected by the Government of Her Majesty
Queen Victoria,
In recognition of the many eminent Services rendered by him
to his Country in Jamaica, Canada, China, and India.
Born July 20th, 1811. Died November 20th, 1863."

This inscription is in incised lettering, gilded. The cost of the monument, we understand, will be about 800*l*.

CAMBRIDGE ARCHITECTURAL SOCIETY.

AT the second meeting of the Society for the Michaelmas Term, held on the 19th of November, the Rev. G. Williams gave an account of "Certain Churches in Egypt and Syria," with the ground plans of which he had been furnished by the Hon. Arthur Gordon, Trinity College, and Governor of Trinidad, by whom they had been carefully measured and plotted when on a tour in the East some years ago. He first spoke of the church of St. Barbara, near Old Cairo, where they say the head of the saint is preserved with some other relics. Most of the churches have more ancient ones below them, and in this case the lower one was dedicated to St. Sergius, and the Holy Family are supposed to have rested on the spot during their sojourn in Egypt. The church, which is 66 ft. long and 48 ft. wide, consists of nave and two aisles, with galleries over the aisles supported by pillars, and adorned with columns in front, which support the roof. The nave terminates at the east end in an apse separated from the church by a screen, but the aisles have square terminations.

He next spoke of St. John's Church near Antinoe, on the Nile. It is higher up the Nile than Antinoe, a town built by the Emperor Adrian in honour of Antinous, who was drowned there. The church, which is 72 ft. long and 34 ft. wide, has a curiously-formed apse, much elongated, so as almost to form a chancel. The prothesis on the south side is ruined, and the nave is curiously divided in the middle. The narthex, also, is peculiar, in being more open to the church than is usual.

The Great White Monastery near Souhaj (Egypt), to the east of the Nile, was described. Mr. Williams quoted at length from Curzon's "Monasteries of the Levant," with reference to this church. It consists of a long and spacious nave with north and south aisles, divided from the nave by colonnades; the apse is peculiar in being formed in three recesses, one to the east, one north, and another south, and around each are niches formed on a trefoiled plan. Another peculiarity about this church is the long chamber parallel to the south aisle. This chamber is supposed to have formed the main portion of the monastery. Pocock mentions that he noticed the eagle with a cross and also with crown carved, and conjectured that St. Helena must have been connected with the building of it, which conjecture is strengthened by an ancient tradition mentioned by Curzon that such was the case.

REPORT ON STEAM CULTIVATION.

THE following summary of the Report of the Judges on Steam Cultivation at the Leicester meeting of the Royal Agricultural Society has been furnished us:—

"The society offered at Leicester a first prize of 100*l*., and a second of 50*l*., for 'the best application of steam-power for the cultivation of the soil;' and in adjudicating upon this general 'Class I.,' the judges lay down a most important principle.

'The prizes in this class,' they say, 'being offered for the best application of steam-power to the cultivation of the soil, without regard to the extent of the occupation, we had no hesitation in restricting the entries to such systems as worked on the *direct* principle, believing that *on large areas* steam could be more economically and efficiently employed in this way than on the *roundabout* system. Having come to this conclusion, it was apparent that Fowler & Co. were alone in the field; and the only point to determine was, which of their systems was most meritorious. The absence of Messrs. Howard's double engines was a source of much regret to those who visited the trial-fields, anticipating a keen struggle between the celebrated firms of Fowler and Howard.'

Unfortunately the public thus had no opportunity of seeing the Bedford direct tackle compete with the Leeds direct tackle in area or quality of performance, in cost of work done, and in other points of comparison; but we have here an official and authoritative adoption of direct-acting in preference to stationary engine apparatus, as the most economical and efficient, excepting in special cases provided for in 'Class II.' Is this decision of the judges borne out by the experiments made?

No roundabout or stationary-engine machinery was tried against the single and double engine direct-acting sets in Class I. But in that class the first prize went to a double-engine apparatus, and the second prize to a single-engine apparatus, direct-acting; and both this and also another direct-acting tackle was tried in Class II. against the roundabout sets.

The trial [in Class I.] completely proved that for economy and expedition of performance the roundabout is decidedly inferior to the direct-acting machinery, and could have stood no chance whatever if it had entered into competition in Class I.

In Class II., the society offered a 1st prize of 50*l*., and a 2nd prize of 25*l*. for the best application of steam-power (we suppose for cultivation) adapted for occupations of a moderate size.' If either of Fowler's direct-acting sets did more and cheaper work, and lost less time and engaged less labour in travelling between one field and another, how was it that Howard's roundabout tackle, nevertheless, won the 1st prize in this class, and that Fowler's sets were considered ineligible altogether? It was simply a question of the prime-cost of the machinery.

'There was not [say the judges] exhibited at Leicester any direct system made up of a travelling anchor and a travelling windlass, driven by an ordinary portable or traction engine. In the absence of any such arrangement, and considering all the points we have above alluded to, we are driven to the conclusion that the roundabout system, which can be worked by an ordinary portable engine, is the only one exhibited at Leicester which fulfils the conditions under which the prizes in Class II. are offered by the society. . . . . Bearing in mind the conditions as to the cost of the apparatus, which, in our reading, excludes Nos. 4 and 6 (Fowler's direct-acting sets) from being fit for 'occupations of moderate size,' we were unanimous in awarding the 1st prize of 50*l*. to No. 2, Messrs. J. & F. Howard, of Bedford.'"

CHURCH OF ST. JOHN THE BAPTIST, LEYTONSTONE.

THIS church was built by the munificence of Mr. Cotton in the Early English style of thirty years ago, and has been transformed from looking cold and dingy to warmth and brightness. The old organ, one of the kind which emitted melody by a skilful player turning a handle, has been removed from the gallery, and a new organ has been erected by Gray & Davison on the south side of the chancel. The choir seats have been rearranged.

The floor of the chancel has been laid with Minton's tiles; the stone font altered and inscribed with "Suffer little children to come unto me." The pulpit has been placed on the gospel side; the desk and fittings, the kneeling-rail, and gas standards are of Hardman's manufacture. The altar-cloth, the offering of one of the congregation, and the kneeling-cushion, the work of the ladies, are richly embroidered.

The flat bays of the ceiling and the shelving sides of the roof are coloured light, with red and black ornaments running next the mouldings; a broad border is painted over the cornice in brown and grey, with a blue sexfoil and gold *fleur-de-lis* in the centre of each length.

The principals, girders, and supports of the roof, with the queen-posts, are painted light grey, alternately ornamented with green, marone, and brown, slightly relieved with black and gold; the corbel brackets supporting the roof are white, brown, and gold. The upper part of the walls are a warm tint of grey, the lower part marone; the window mullions and linings are white, with ornaments and lines in a dark red.

The roof of the chancel is light blue, sprinkled with stars, the groins have a warm tint, relieved with marone; the walls a deep gray, with a wide border on a gold ground, in green and brown, under cornice mouldings. The Decalogue, Lord's Prayer, and Creed are painted on the north and south walls, and the sides are powdered with grey and red. The lower part of the walls, about 5 ft. high, is light olive, with horizontal borders, in rich colours and gold, except the recess for the altar-table, which is arcaded, with gold panels, upon which are painted, in encaustic colours, the sacred monogram and symbols. The wall-spaces between the three lancet windows are diapered with a rich flowing pattern to harmonize with the stained glass.

The arch mouldings are powdered with black and gold; and on the label is written, "Lord, I have loved the habitation of Thy House;" over the side arch, "Let Thy priests be clothed with righteousness;" on the organ, the opening sentence of the "Te Deum;" over the gallery, "All Thy works shall praise Thee, O God;" in the porch, "Be ye all of one mind, having compassion one of another." The designs are by Mr. W. Pitman; and the decoration by Messrs. Hayward & Pitman, of Newgate-street. The building, having been closed a few weeks for general repairs by Mr. Cains, builder, Leytonstone, and for the execution of the above works, was opened on Sunday, the 29th ult.

STATE OF ST. MARGARET'S CHURCH, LOWESTOFT.

THE churchwardens and committee appointed to assist them in carrying out the repairs of the parish church have reported:—That, in pursuance of the resolution of the vestry meeting of the 23rd June last, they proceeded to obtain the required assent of the diocesan and the archdeacon to the plan proposed for rebuilding the south aisle, and then entered into a contract with Mr. C. Godbolt, of Harleston, and his sureties for the proper carrying out of the same. These preliminary steps being effected, the contractor immediately commenced pulling down the south aisle; and the outer wall had been nearly removed, when it was discovered that the south arcade wall of the nave had for some time partaken of the outward inclination of the aisle wall, an inclination that threatened to increase with a rapidity which might have suddenly put a stop to all further proceedings, had not prompt measures been instantly resorted to to retain the wall in its then position. Mr. Clemence, the architect, having pointed out the serious consequences likely to arise from the dangerous state of things, he was directed to examine the entire fabric, and to make a report on its present state.

Mr. Clemence, having given the result of his examination, said there was no immediate danger, it being well shored up, but his deliberate opinion was that the sooner the wall be taken down and rebuilt the better. The north wall of the nave was secure; the south-east angle of the tower above the leads of the nave roof requires rebuilding. Estimated cost, with new lead gutter to the nave, 650*l*.

On the receipt of this report, the committee consulted with Mr. Clemence. The committee expressed its confidence in Mr. Clemence, but in view of the diversity of opinion prevailing out of doors it was considered desirable, both by the committee and Mr. Clemence, that the opinion of another architect from a distance should be taken, and it was determined to request Mr. Teulon to visit the church, and report to the committee. Mr. Teulon accordingly re-

ported upon the subject. The report contained various suggestions, and Mr. Teulon stated that he did not feel able to certify the church perfectly safe in its present state. At the request of the committee, Mr. Clemence gave a more detailed report upon the plan he had proposed for rebuilding the south arcade wall, and he estimates the cost of the works and putting in new gutter boards and bearers to the nave roof at 700*l*. A vestry meeting has been called to consider this subject.

EUSTON SQUARE AND STATION.

Few, if any, architectural works worthy of notice are promised by any of the private bills which are to be brought forward in the next session of Parliament; but it is satisfactory to observe, in the very lengthy *Gazette* notice of a bill to be brought in by the London and North Western Railway Company, a short paragraph that gives promise of an important new architectural effect from an existing building—the dropping of the canvas, the presentation to the public in an æsthetical sense, "after all these years," of the propyleum which furnishes the grand entrance to the Euston Station. The Company give notice, in their New Works and Additional Powers Bill, that they will apply *inter alia* for power, which it is to be hoped will be granted, to make and maintain, in the parish of St. Pancras, an approach-road to their Euston Station, commencing from and out of the Euston-road, at a point nearly equidistant from "the eastern and western ends of Euston-square, thence proceeding in a direct line to, and terminating at, the principal entrance to the Euston Station in Drummond-street; and to provide for the removal of the gates, bars, or railings now erected and standing on or across the site of the proposed approach-road, and for the extinction of any rights or privileges that may interfere with those objects." The directors may be congratulated on their having arrived at the resolution to carry out, although somewhat tardily, what must have been the intentions of the architect, and of their predecessors in office, in the inception and execution of this design. It may seem paradoxical to say that a structure which dwarfs everything in its vicinity has not hitherto been seen; but this is in a sense true, and it is satisfactory to have the expectation that a point of sight worthy of the work is at last to be provided.

A SHAKY WALL.

Sir,—A passage leading to King-street, St. James's-square, until recently enjoying no very delicate fame, and now known as "Pall Mall-place," consists, on the west side, of a most unsightly structure, which bulges out at the centre with a truly disruptive and dangerous aspect. The other side is a row of shops of the first class, and how the shopkeepers and their customers are affected by the menacing indications over the way, I know not; but assuredly, until the state of things is pronounced, on authority, to be safe, I shall pass another way. Would you have the goodness to take a momentary "survey" of the place, and let the public know whether so unusual a curve in a rather long line of building, is compatible with stability. M.A.

*** The appearance of the wall in question is certainly not quite satisfactory, especially at the northern end.

A SCALE FOR DRAWINGS IN PERSPECTIVE.

Sir,—In the "Life of Sonnin," an architect, who flourished in Northern Germany from the middle to the end of the last century, I find a passage which I should be glad to have explained. Sonnin was commissioned to make a perspective drawing of a garden belonging to a certain Count von Ahlefeldt; he did so, but "die Zeichnung hat das Besondere, dass man vermittelst einer am Rande angebrachten Scala der Längen und Breiten die Grösse eines jeden Gegenstandes auf der Zeichnung ausmessen kann." This I would English thus:—"There is this peculiarity about the drawing, that the size,—in height or in length,—of every object may be measured off from a scale attached to the margin of the picture."

Can any of your readers oblige me with information as to this "scala?" If a scale can be attached to the side of any perspective, whereby dimensions, not only of height, but of *width*, can be measured, this would be of the greatest possible use in the case of photographs taken from nature. Alfred Strong.

THE DUTY OF MEMBERS OF A BOARD OF WORKS.

Sir,—Knowing your valuable paper stands pre-eminent as an authority, will you favour me by stating in your next impression whether you deem it a dereliction of duty, and altogether inconsistent or otherwise, with the position of a member of a Board of Works, to undertake to do and make out the accounts of a contractor, who is executing works under the Board, with which he (the member) has been and is still connected? A Constant Reader.

*** A member of a Board so acting professionally for a contractor, would incapacitate himself for rightly discharging his duty to the ratepayers, whom he is supposed to represent.

CEILINGS AND PARTITIONS.

Sir,—I am glad to find attention drawn to the material of which ordinary ceilings are composed, as it seems strange that materials so opposite in their natures as timber and plaster should so long have been used in such close connexion and with such numerous failures.

I quite agree with your correspondent "B. F." that it is often attributable to the laths being fixed too close together to allow of a good key, but believe it more often arises from the sagging and shrinkage of the joists where there is no counter ceiling, which is, of course, increased when furniture is placed in the room above, and the constant vibration, caused by motion, is confined to a portion of the room chiefly near the centre. While the timber yields, the plaster, being a rigid material, must crack, and it is only a question whether the whole falls or only the floating and finishing coats, which is often the case on account of the defective key formed by the pricking up coat.

It appears to me that a material is required something of the nature of felt, which may be nailed to the underside of the joists, with a surface similar to drawing paper to allow of distemper; the edges may be butted and hidden by a small moulding, or by stiles to form panels. The material must be uninflammable, as there is probably no better fire-resister in houses than the plaster; the cost must also be considered, as it is in smaller buildings that its use would be of more value than in larger ones.

If some such material could be invented also for quarter partitions, instead of lath and plaster, it might prevent the annoyance of ugly cracks occasioned by the before-mentioned causes, and which few architects have been free from during the last trying summer. J. D. M.

Sir,—I have no doubt there will be many persons act out the recommendation in your pages, and paper their cracked and dangerous-looking ceilings.

They will very much strengthen them by twice or thrice painting, and then distempering may be cleaned off without damage to the paper. For the same reason I wish our architects would have all plaster enrichments painted: it preserves them, they clean well, and will finish sharp and clean after being many times distempered.

Twenty Years' Experience.

PAINTING ON ZINC.

In your paper I read concerning the "Means of making paint adhere to zinc." I think there is an easier method to apply colours on zinc, by which paint adheres so closely and so firmly that the zinc may be bent in all directions, without the paint depart, till the zinc breaks. So far as I know this paint resists heat and cold, air and moisture. I beg to enclose a small piece of zinc, painted, as sample. With the same results of firmly adhering, this paint may be used for iron, wood, stone, terra-cotta, &c., in every colour, without light and temperature altering the same, and better protecting the painted object than usual linseed paint. The paint alluded to can be applied easier and quicker than linseed paint.

I do not know if it is known in England; in any case, it is not generally known. If this communication be of some utility to you, I will be glad to consider this as a small tribute of gratitude which I feel indebted to your excellent paper, the *Builder*, which has procured me for several years many an agreeable and useful hour, and of much assistance in the beginning of my career. With much regard, I remain, D. Juan den Brink.

Rotterdam.

*** The specimens sent are entirely satisfactory. We shall be glad to know the nature of the paint or process.

CHIMNEYS.

Sir,—In reply to your correspondent "Stat Veritas," in your publication of November 21st, I beg to say that circular or oval flues or chimneys will do equally well for conveyance of smoke; but the determining points which secure an upward draught or a down blast of smoke may be had with either; and if he had the most correct information as to what would make a good draught, he might still be defeated in getting it carried out by the workmen, who, to secure a good regular outside appearance, often make the inside work, especially in chimneys, to suit their own convenience instead of the conveyance of smoke. The only sure way I can find to meet such difficulties is to get flue linings made at the pottery from tested models, the exact form and dimensions to suit the different sizes of chimneys. I quite agree with your correspondent as to the almost total want of practical knowledge to be found everywhere on this subject. It is much to be lamented that in matters so deeply affecting the health and comfort of all, as good draughts in chimneys, good ventilation in dwellings and in the streets and sewers of towns and cities, there should be so much ignorance in those having the management, and so much thwarting of such improvements through the avarice or indifference of those having the control. Were those connected with house-building to study more accurately the laws by which the elements are governed and their power bounded, both separately and in their compounds, and employ these natural inclinations, so irreversible, to aid them in carrying out their plans for health and comfort in the dwellings they build, there would be a very remarkable improvement.

N.

LINE OF FRONT: METROPOLITAN DISTRICTS.

The Wandsworth Board of Works (Appellants) *v.* Hall (Respondent).

The respondent in this case (Court of Common Pleas) had been summoned by the Board of Works on the ground that he had built in front of Thurlow Cottage, Wandsworth-road, beyond the general line of building frontage. It happened that, at the time the respondent built, the architect of the Board had not actually laid down any building line at the spot in question; and the magistrate held that under these circumstances he had no power to interfere and order the demolition of the respondent's building, and he dismissed the complaint. The question for the court was, whether the magistrate had power to make the order for demolition.

Mr. Francis appeared for the appellants, and Mr. Wharton for the respondent.

The court held that if a man built beyond the proper building line, and the line was afterwards fixed by the architect of the Board, the magistrate had power, notwithstanding the line was not laid down until after the building was erected, to order the demolition of the building.

Judgment for the appellants.

A WATER SUPPLY REGULATOR.

Mr. Charles Geoghegan, architect (of Dublin), has just perfected a very useful invention. The pressure at which the Vartry water will be delivered in the houses of Dublin will not be strictly constant, and may be expected to cause occasional accidents by the bursting of weak or otherwise defective pipes. To obviate this inconvenience, various contrivances have been devised; but Mr. Geoghegan's possesses, as far as we can judge, important advantages over those of his competitors. It is self-acting; it costs but 2*l*. or 2*s*. 10*s*., according to size; and, being of very simple construction, it is not likely, when once set up, to get out of order. The principle of the invention, so far as we understand it, is as follows:—The supply-pipe from the main leads into a closed cistern. When the water in this cistern rises to the maximum height which is compatible with the perfect safety of the house-pipes, the air which occupies the upper part of the closed cistern is pressed through a connecting-pipe into a rectangular vessel, called the regulator, one compartment of which is divided by a vertical partition into two compartments, each of which is half filled with water, and which communicate with each other at the bottom. The air which enters at the top of one of the compartments depresses the water therein, and by doing so raises the level of the water in the other. This water in the other compartment contains a float, which, of course, rises with the water, and, by means of a projecting stem, turns a cock in the supply-pipe, and thereby cuts off all further supply and pressure. On the other hand, when the level of the water in the cistern sinks, the compressed air above it expands, and losing a portion of its elastic force, permits the air which is in the upper part of the first compartment of the regulator, and which is in free communication with it by means of the connecting-pipe, to yield to the hydrostatic pressure produced by the head of water in the second compartment. The level of the water in the latter sinks, therefore, and by doing so brings down with it the float, and thereby opens the cock in the supply-pipe. Thus the required supply, and no more than the required supply of water, is maintained without

the necessity of any interference by the proprietor or his servants. The apparatus has been exhibited in action in the Corporation-yard, Winetavern-street. The manufacturers of the instrument are Messrs. Ross & Murray, of Middle Abbey-street, Dublin.

SCHOOLS OF ART.

The Gloucester School. — The Tolsey was crowded by the School of Art pupils and their friends, at the annual distribution of prizes. The mayor presided, and many of the leading supporters of the school were present.

Mr. J. D. T. Niblett, secretary of the school, read the report of the committee. It said:—

"We have the pleasure to report that the Gloucester School of Art has gained this year a greater number of successes in the various examinations established by the Department of Science and Art than in any previous year of its existence. In the National Competition it has gained three successes, viz., two national bronze medals, and one Queen's prize of books. The works of eleven of its students were chosen to enter into this competition. Three students have been nominated by the department to prize studentships, by which they are entitled to gratuitous instruction at the School of Art."

Mr. Gambier Parry, the president of the school, addressed the meeting and distributed the prizes.

The Carlisle School.—The annual meeting of the friends of this school has been held, in the school-room, Finkle-street. The mayor (Mr. A. Davidson) presided. In opening the proceedings, the chairman said he was glad to be able to congratulate the friends of the school on its healthy and prosperous condition. There was not much to boast of, because it unfortunately happened that fewer students came forward to take advantage of the opportunities given to them, than might be expected in a large population like that of Carlisle. However, the school was making progress. It had been in existence for fourteen years, and during the greater part of that period it had had to undergo many vicissitudes. Happily, three years ago, it had got quit of the debt which had been pressing it down, and he believed it was now in a better condition than it had ever been before. The number of students who had passed their examination had increased over the number of last year, and a corresponding increase had taken place in the number of certificates. Another very pleasing circumstance was, that the treasurer had a balance in hand.

CHURCH-BUILDING NEWS.

Rockingham.—The church here has been re-opened, after the restoration of the chancel. In the spring of the present year, the roof of the chancel was found to be in such a dilapidated condition, that it was determined to replace it by a new one, of high pitch, and of a better character than the existing one. At the same time it was thought a good opportunity by the patron, Mr. G. L. Watson, to add a chapel, on the south side of the chancel, to receive the greater portion of the monuments belonging to his family, which had previously been in the chancel, and prevented its being rendered available for the choral services of the church. By the removal of a large monument on the north side, the aisle was opened out by the insertion of two arches and piers, the mouldings of which were taken from the fragments already alluded to. At the same time the east window was removed to the new chapel, together with a memorial window, erected in 1853, to the memory of the late Hon. Richard Watson. The subject is "The Ascension." This window has been replaced by one of larger dimensions, and of an earlier date, which is filled with stained glass, executed by Messrs. Heaton, Butler, & Bayne, under the superintendence of the Rev. F. H. Sutton, the gift of Mr. Thomas Watson. The subject in the centre is "The Crucifixion," and on either side are, "The Agony," and "The Resurrection." Beneath are smaller subjects, "The Nativity," "The Baptism," and "The first Miracle of our Lord." The reredos is the work of Mrs. Bigge. The chancel has been restored by the rector. A memorial stained glass window, by O'Connor, has been placed in the west wall, just over the door, by Mrs. Gunning Sutton, and north of this another window is about to be placed by the rector, who has not yet decided on the subject of the illustration. The wall decorations were done by Mr. Hobbs. The restoration has been carried out by Messrs. Law & Son, of Lutterworth, from plans designed by Mr. E. Browning, of Stamford, architect. The interior is not quite complete, the chancel seats, pavement, &c., having still to be put in. An effect has been produced in the colour of the chancel walls, by the addition of some Indian red in the last coat of plaster. This contrasts with the white marble of the monuments. The family vault is under the north side of the chancel, and is now approached from the outside, the entrance from the chancel having been closed.

West Somerton.—At a meeting of the Norfolk Archæological Society in this town and neighbourhood last year, the fresco paintings on the walls of St. Mary's Church were examined with interest, and it was resolved to have them illustrated in the society's publications. These paintings had then been recently uncovered, through the exertions of Mr. J. T. Bottle, architect; and this gentleman has now been instructed to prepare designs for a complete restoration of the fabric. It is believed, from various indications, that further paintings exist on other portions of the walls under the incrustations of whitewash, &c., and every exertion will be made to discover these, and preserve them. An appeal will probably be made for funds to carry out the proposed works of restoration.

Nottingham.—St. Stephen's Church has been consecrated. The building was the late Trinity Free Church, used as a Chapel-of-Ease. The church is situated on Bunker's-hill, off Lower Parliament-street, in the midst of the class whom it was originally intended to benefit. It contained 550 sittings, but owing to the success which had attended the efforts put forth, the accommodation had become inadequate to the increasing requirements of the parishioners, and it was resolved to enlarge the chapel. This has now been effected by a partial rebuilding of the old edifice; and the new district of St. Stephen's is assigned to it. The main front of the building has been brought forward several feet towards Bunker's-hill, and the space intervening between the chapel and the boys' school at the sides has been covered over. This arrangement gives to the new church an area of 102 ft. in length by 42 ft. in width. To avoid losing the advantage of the school windows, a roof in the form of a lean-to has been thrown over the space, supported by columns occupying the place of the former side-wall. These columns, in conjunction with the support given to the curved ribs of the main roof, without causing any serious obstruction to the view, tend to conceal what would otherwise be the irregular appearance which the room presented. The whole of the walls have been strengthened in accordance with the requirements of the Ecclesiastical Commissioners in regard to all similar enlargements of churches, and they are lined with a red brick facing, varied by blue brick courses in the form of panels. A space has been set apart for a larger chancel, and also for a porch. The architect was Mr. T. C. Hine, and the builder Mr. J. White.

East Barnet, Herts.—The church of St. Mary the Virgin was re-opened on Saturday, the 28th of November, having been closed during the summer months for restoration and enlargement. The church is one of some interest, having been erected in the early part of the twelfth century, by an Abbot of St. Alban's, for the spiritual benefit of the poor inhabitants of that locality engaged in wood-cutting in the then surrounding forest, and a considerable portion of the ancient fabric still remains. The additions consist of a new south aisle, built in the Early English style of architecture, with walls faced with Kentish rag stone, and windows and dressings of Bath stone. The roof, framed with open timbers, is covered with Staffordshire tiles. The arcade opening from the ancient nave is of two arches, supported by a polished marble shaft, with richly carved capital. The church throughout is fitted with open seats of deal, stained and varnished, and capable of accommodating 420. The passages and communion space are paved with Minton's tiles, that in the latter being of rich encaustic patterns. The east wall of the chancel has been enriched by the artistic writing of the Commandments, executed by Mr. West. The whole of the works have been carried out under the superintendence of Mr. A. R. Barker, the contractors being Messrs. Dove, Brothers.

Whitby.—The ancient church of St. Hilda, at Egton, near Whitby, has fallen into a state of decay and complete dilapidation. During 700 years it has been uninterruptedly used for divine worship, but its condition is now so unsafe that at any moment it may fall into a mere ruin. The Roman Catholics have recently erected a large chapel, and great exertions are being made to extend Roman Catholic interests among the people. The newly-appointed vicar (the Rev. I. Fish, many years the chaplain and superintendent of the Castle Howard Reformatory) is anxious to set up schools and rebuild the church. The parishioners are nearly all poor persons, and the peculiar circumstances under which the land is held, most of it being in Chancery, and the remainder in the hands of Roman Catholic owners, make it impossible to hope for aid from the proprietors. A subscription list has, therefore, been opened.

DISSENTING CHURCH-BUILDING NEWS.

Bristol.—Clifton-down Congregational Church, just erected at the foot of Clifton-down, from the designs of Messrs. Hansom & Son, of this city, architects, for the congregation formerly worshipping in Bridge-street chapel, has been opened for divine worship. The church consists of nave, chancel, north and south transepts, with vestries and lecture-room beyond. The principal front faces the Down. The centre portion will be occupied by a tower. At the west end is an open porch of three arches, moulded and carved in stone, and groined. On the right side of the tower it is intended to erect a house for the minister. The sides of the building are ornamented with a parapet and pinnacles surmounting a range of traceried windows; and at each end of the transept is a rose window. The building, as at present, with the land, has cost about 10,000*l.*, and all but 400*l.* or 500*l.* of that amount has been raised. The tower and minister's house are for the present deferred.

Redcar.—The foundation stone of a new Wesleyan Chapel, Sunday school, and class-rooms, has been laid here. The cost will be about 1,650*l.* The chapel is in the Early Decorated style of Gothic architecture. The front elevation will be faced with red pressed bricks, Castleton stone dressings, and ornamental bands in white bricks. The building has been let to the contractors for 1,381*l.* 9*s.* Bricklayer, Mr. Scott, Middlesbrough; mason, Mr. Lord, Middlesbrough; joiner, Mr. T. Watson, Redcar; painter, Mr. T. D. Guy, Redcar; plumber and glazier, Mr. Kershaw. The heating apparatus was supplied by Messrs. Cunningham & Wain, Middlesbrough.

Books Received.

"*The Ecclesiologist.*" Masters: London. 1868.

THE December number of *The Ecclesiologist* contains the announcement that this periodical will not again appear. The first number was published in November, 1841. According to the editor's address to his readers its continuance has been a struggle from the first. "The stress and obligation," he writes, "of other—though not alien—occupations, have overmastered our bark." The number includes an article on the Fairford Windows adverse to the ascription of them to Albert Durer.

The Spectator: a new edition. With Introduction, Notes, and Index, by HENRY MORLEY. London: George Routledge & Sons.

WE have here the *Spectator* complete, reproducing the original text, in one compact volume,—a charming edition of a work that will be prized so long as the English language is studied. Professor Morley's Introduction is sound and sensible, and the same may be said of his notes.

Cassell's Technical Manuals: Linear Drawing. By ELLIS A. DAVIDSON. Cassell, Petter, & Galpin, London and New York.

THIS little work is intended as a text-book for teachers in schools of art and science, training colleges, national and other schools; and also as a manual for self-instruction for artisans and the public generally. It shows the application of practical geometry to trade and manufactures. The author is a lecturer on science and art in the City of London Middle-class Schools. In addition to illustrations connected with the lessons, six pages of the application of geometrical drawing to iron and wood work, masonry, mechanism, and design, are appended.

The Mechanic's and Student's Guide in the Designing and Construction of general Machine Gearing. Edited by F. H. Joynson. Edinburgh: Nimmo.

This is a practical treatise on the designing and construction of eccentrics, screws, toothed wheels, &c., and the drawing of rectilineal and curved surfaces, with practical rules and details. Mr. Joynson is the author of a work on "The Metals used in Construction," and the work under notice seems well adapted for the practical instruction of mechanics and students.

Address to the Members of the Historic Society of Lancashire and Cheshire. By Joseph Mayer, F.S.A., &c., President. Liverpool: printed by Thomas Brakell, Cook-street.

On the Preparations of the County of Kent to Resist the Spanish Armada. By Joseph Mayer. Printed by Brakell, Liverpool.

The first of these was read on November 5th, 1868. In course of it Mr. Mayer makes interesting remarks on American archæology. He speaks of Mr. Blackmore, of Liverpool's, purchase of the celebrated museum of American antiquities collected by Messrs. Squier & Davis from the western "mounds." That purchase now forms the nucleus of a collection from "all the four continents," and which Mr. Mayer characterizes as not only the most perfect in the world, as illustrating the age of stone, but the only collection in which it has been hitherto attempted to grasp the whole subject in that detail which the student must require." At the close of the address, Mr. Mayer says, as to muniment rooms,—

"With singular care the documents are preserved which relate to the mere events of to-day, the profit of the family; but for those dim parchments and ancient volumes, which are the title-deeds of its rank in honour, the record of its worth or its unfitness for that high station which England gave, and has often snatched away, what place is devoted for them? Too often a distant and dismal chamber, where rats gnaw, rain beats in, mice and worms burrow and build. I am not speaking without book, gentlemen! and it would even be well if the culpable carelessness of owners stopped at this point; for in too many instances the muniment-room is abandoned without thought to the tender mercies of children and housemaids. Every day manuscripts of the deepest importance to the nation are torn up for nursery toys, are cut to pieces for silk-winders, are absolutely burnt in grates and garden-furnaces. One feels a positive thrill of indignation in recalling some stories of this sort which rest upon authority incontrovertible. Such irreparable waste of the national property, for national it is, cannot be allowed longer to continue. I should suggest that the heads of the South Kensington Museum, or other officers of departments where there is room to spare, should issue an invitation to all persons having such documents in their possession, should by that means collect these treasures together, and there and then examine and report upon them. Some such course *must* be followed. It would be preferable that the owners should solicit the attendance of some skilful person from the British Museum to examine their muniments,—and such requests are rarely refused, I may add;—but even if this be done, as in a very recent instance, the confusion is often found to be so utter and complete that half a lifetime might almost be spent in restoring order, and in properly examining the deeds. I take it this is one of the foremost questions now demanding the attention of archæologists. It must be solved. One-half the controversies which occupy the time and study of leading men in our science might, I feel sure, be very speedily set at rest if all the private collections of England were thrown open."

The second paper by Mr. Mayer was read on April 2nd, 1868. It contains many curious and interesting quotations from the MS. papers of Roger Twisden, J.P., and Captain of the Light Horse of the Lathe of Aylsford, A.D. 1585-1596.

DIARIES.

The No. 8 "Diary" published by Letts & Co. gives a whole page to each day, and is well suited both for business and literary users. This firm have sent us a packet of their various diaries and pocket-books of *last year*, which have been duly committed to the waste-paper basket. ——The "City Diary," issued from the *City Press* Office (seven days on each page), contains a considerable amount of information chiefly respecting the Corporation and the City generally.—— Blackwood's "Desk Diary, No. 4," contains seven days on each page, and includes postal maps. The "Shilling Scribbling Diary," issued by the same firm, gives more room for each day's entry, and is interleaved with blotting-paper; altogether a useful book.

VARIORUM.

As if in reponse to our desired geological chart for architects and builders, as well as for geological students generally, a new edition of Professor Morris of University College's Geological Chart has been issued by Reynolds, 174, Strand. This chart contains a considerable amount of information as to building stones, slates, flags, limes, &c., to be found in the various strata, collected in a separate column under the title of "Uses in the Arts, &c."——Transactions of the Institution of Engineers in Scotland, with which is incorporated the Scottish Shipbuilders' Association: Twelfth Session, 1868-9. This issue contains an Introductory address by Mr. James M. Gale, the president, read October 28th, 1868; a paper on ships' lights, by Mr. James R. Napier, F.R.S., read October 28th, 1868; experiments on the delivery of domestic cranes, by Mr. Thomas Hoey; report of the council, &c. The president in his address speaks of the Glasgow Sewage Irrigation scheme recently proposed by Mr. Bateman and Mr. Bazalgette. The scheme is estimated by them to cost, including cost of works and pumping, ¼d. per ton of sewage distributed, and if only ¼d. per ton is realized from it, there will be an annual profit of 58,000*l.* after paying all expenses. The proposed outfall on the Ayrshire coast is at a considerable distance from any habitation, and is surrounded by a dreary waste of sand; but is separated from Glasgow by sixteen miles of country of an average height of 120 ft. above the sea, and the cost of pumping the whole or any considerable part of the sewage of Glasgow over this elevation was a serious obstacle to the adoption of this outfall, till it was suggested that the whole distance might be tunnelled.

"This," said the president, "at once placed the Ayrshire outfall in the same position as the river outfall, as regards the annual expense of pumping and the height to which it would be necessary to raise the sewage of the low-lying parts of the town, or at least reduces the whole difference between them to the difference in the length of conduit, which cannot be put at more than four or five miles. This small extra outlay for an unobjectionable outfall, and a tract of sandy land to take up surplus sewage, led Messrs. Bateman and Bazalgette to adopt the Ayrshire outfall."

Messrs. Bateman and Bazalgette propose three lines of intercepting sewers on the north side of the river, and two on the south, with one pumping station at the Saltmarket, and another at Polloksheilds, at the commencement of the main conduit to Ayrshire, the average height of lift for the whole sewage being 32 ft. The sewage when so lifted will command for irrigation about 8,000 acres of very suitable land, lying between Paisley and Bishopton, by gravitation, but an additional lift will be necessary for that part proposed to be utilized on the Ayrshire coast. The estimate for the whole work is about 1,250,000*l.*, but it does not include the branch conduits over the large areas of ground proposed to be irrigated, the pumping in Ayrshire, nor the cost of preparing the land to receive the sewage water; neither do they in their estimate of the assessment necessary to carry out the works take credit for the very large return which must in time accrue from the use of the sewage-water. Mr. Gale is of opinion that this is the only project that can be devised for the thorough purification of the River Clyde, and he hoped that the next ten years will see it accomplished.—— "A Synopsis of the Patent Laws of various Countries." By A. Tolhausen, Ph.D. London: Trübner. Dr. Tolhausen is a translator at the Patent Museum. This synopsis is a second edition, revised, and enlarged. The first edition was published in 1857, and is out of print. The present abstract of patent laws relates to thirty-three different countries, and is very compendious and methodical, and must be very useful to inventors and manufacturers, as well as to legislators on any question in Parliament relating to the patent laws.——"Essay on Indian Agriculture." By Lallah Luchmi Narain, Banker and Municipal Commissioner, of Bareilly. Calcutta: printed by Hay & Co. This very interesting pamphlet contains an English translation, by the author himself, of a paper in Hindu, read by him to natives of India at the Rohilcund Exhibition, Bareilly, in December, 1866. The English, though not quite according to rule, is better than that of many a translator, and the substance is excellent. The author urges more attention to agriculture, on the part both of the Government and the people of India; points out the hinderances, and expatiates on the advantages. It is an able essay, and, but for a few very slight defects in the English, might have been written by one of our own agricultural writers. We give a specimen:—

"It is worthy of consideration that the productive power of land in India is in no way inferior to that of America, and India is governed for 100 years by the same race of men. Why should the cultivation in this country have been carried on according to the old methods, while America has made such rapid advances in that way? The answer is simple. No endeavour has been made in this country towards instructing natives in this branch of knowledge, while in America agriculture is carried on according to scientific principles best adapted for that purpose.

The assertion, if made, that the people of India are not capable of receiving such instruction, it cannot be supported, inasmuch as no trial has ever been made, nor can it fairly be made, by reason of the Government having taken no steps on this behalf. Experience shows that we have made, and are making, great improvements in other branches of knowledge which Government has been pleased to teach us. The science of mathematics is the most difficult and dry science; and if we have improved in it why should we not be able to advance in agriculture, which is not so difficult? The development of the resources of the country depends on the instruction of the people in agriculture. It is essential that the Government should take the subject into favourable consideration.

A number of zemindars and cultivators should be selected for the purpose of acquiring such knowledge, and this can be done in no better way than by establishing agricultural schools, such as are established in France, England, and other countries of Europe.

Should the Government be pleased to make agriculture a branch of education in its public schools, for the maintenance of which it expends thousands of rupees, the measure will lead to manifold good results. Hundreds and thousands of begahs of land, covered with forest and lakes, would be brought under the plough.

This system may be introduced experimentally, as it was done in France, in 1817, or as the village schools were first established by the late Mr. Thomason in eight districts of the north-western provinces, as a probationary measure. If the experiment realise the expectations, *which it certainly must*, the system may then be extended to all zillahs.

Exhibitions have been set up by order of Government in the several districts, with a view to the advancement of the agricultural products of the country, and improvement of the breed of cattle; but I am of opinion that the subject in view will not be gained unless agricultural instruction is first of all introduced in our schools; for until the people are trained in the principles of agriculture, both as an art and science, they cannot reasonably be expected to make any improvement in the quality of the produce which their lands yield. They can bring for show only such products as can be raised on the old principles."

——*Frazer's Magazine* for December contains an interesting paper by the Rev. E. Girdlestone, vicar of Halberton and canon of Bristol, on Landowners, Land, and those who till it. This reverend gentleman is well known for the interest he takes in the physical and moral improvement of the agricultural labourer. He has been the means of increasing the wages, and ameliorating the treatment of these poor serfs in his own district, by obtaining the removal of no less than 100 of them, many with wives and families, to other localities where their wages have been often doubled, as well they might be, from the miserable pittance of 7s. or 8s. a week, which till lately were the regular wages; and even still they are only 9s. Mr. Girdlestone has, of course, been annoyed and insulted by the farmer class of his district in consequence of his kindly exertions on behalf of their labourers. Church-rates have been refused, and he has been dragged into law courts; but for all this petty spite he seems to have been quite prepared, and he still pursues his philanthropic course, for which, we feel assured, he has the heartfelt thanks and the high respect of the public. Here are specimens of the gentry he has to deal with, although there are, he says, exceptions of a very different character. He speaks from his own knowledge:—

"A shepherd, an old and faithful servant of a man who farmed upwards of 800 acres, had several of his ribs broken by one of his master's horses. He was confined to his bed for many weeks. Not only did he receive no wages or any other sort of assistance from his master during the whole of the time he was disabled, but the rent of his house, which as a shepherd he had free, was deducted from his son's wages as long as he was unable to look after the sheep. Another man, a carter, also in the service of a well-to-do farmer, saved a valuable team of horses and a wagon from being dashed to pieces, but in doing so was severely injured. In this case great interest was made with the farmer, but in vain, to give if only a little milk for the wife and family. This description of the condition of agricultural labourers in North Devon is not based upon information obtained from interested parties or at second or third rate, or upon a hasty personal visit. It is the result of the experience of a six years' residence in a parish of 7,600 acres and 1,663 people, in every farmhouse and cottage of which the author has been many times a year at almost every hour of the day, and with the habits and circumstances of whose inmates he is nearly as familiar as with those of his own household, and it is notorious that this is a fair average of the whole district. Can any one in such a condition be said to live?"

The bones of their oppressors deserve to be broken.——The Journal of the Franklin Institute, Philadelphia, vol. 86, No. 514: third series, vol. 56. October, 1868. No. 4. Philadelphia: published by the Franklin Institute at their Hall. The issue under notice contains various interesting papers;—on the influence of artificial illumination on the quality of the air in dwelling-houses, translated from the German of a paper by Dr. Gorup-Besanez, and read before the Polytechnic Association of New York, December, 1867, by Dr. Adolph Ott; on proposed method of sinking the piers for the St. Louis Bridge, by James B. Eades, C.E.; on the economical construction of beam trusses, by G. S. Morison, C.E.; editorial items and novelties, and corre-

spondence on fire-proof buildings; lecture notes on physics by Professor A. M. Mayer, Ph. D.; and other matter connected with science and the mechanical arts.——Amongst cheap issues may be mentioned an edition of "The Percy Anecdotes" in sixpenny volumes, published by Berger. The first volume includes "Humanity" and "Beneficence."

Miscellanea.

TERRA COTTA AT SOUTH KENSINGTON.—With reference to the discussion on the subject of terra cotta, reported in our number for November 21st, when one of the speakers was described as the manufacturer of terra cotta used at the South Kensington Museum, Messrs. Alexander Wilson & Son ask us to say that they have completed two contracts, and have three others now in hand for that building.

PENZANCE WATER SUPPLY.—At a recent meeting of the Town Council, the Sanitary Committee reported that they had given the subject of a larger reservoir their best consideration, and were of opinion that the plans of Mr. Matthews were sufficiently comprehensive. Mr. Matthews said the reservoir would drain a watershed of 300 acres. Two-fifths of the estimated rain-fall, calculated on 300 acres, would give 17,424,000 cubic feet annually. This would give 10,000 inhabitants 4 cubic feet, or 25 gallons of water, a day. The reservoir would cover 11 acres, and be 25 ft. deep at the lower end, or have an average depth of 12 ft. It would hold 5,749,920 cubic feet of water, or 40,000 cubic feet a day for 143 days. The present storage was 1,183,000 gallons, or 40 gallons a day for 29 days, so that 172 days' supply would be provided for without any reliance upon any other source. This he considered ample for many a year. But some additions to the same reservoir would cause it hereafter, if occasion arose, to hold 10,820,480 cubic feet. Simply by raising the embankment 2 ft. or 3 ft., one-third more water would be stored. Looking to these facts, he thought the size of the reservoir ample. Mr. Downing said he still thought the larger scheme would be the best and the most economical in the long run. The available watershed was 600 or 700 acres for a weirhead constructed further down towards the first pond at Trengwainton. This might cost something more.

MONUMENTAL SCULPTURE BY MR. JOHN STEELL, R.S.A.E.—Mr. Steell is just completing two pieces of monumental sculpture, which the *Scotsman* describes. One is designed to commemorate the officers and men of the 42nd or Royal Highland Regiment who fell during the Crimean war, or in the suppression of the Indian mutiny, and is being got up at the expense of the surviving members of the regiment. The monument is to be a mural one in the Gothic style, and will be placed in Dunkeld Cathedral. The chief feature of the monument will be a large pointed panel, surrounded by a richly-moulded and lofty framework, and filled with an alto-relievo in white marble. It is with the latter that Mr. Steell is engaged. The subject is taken from the lines in "The Black Mosquetaire," in the "Ingoldsby Legends," beginning with,—

> "But a sombre sight is a battlefield,
> To the sad survivor's sorrowing eye."

The central position is occupied by the supposed survivor, who has gone to the battlefield in search of a missing comrade. This is a life-size figure of a soldier of the 42nd Regiment. A slab underneath the sculpture will bear a suitable inscription. The second monument is a mural tablet, which is to be fixed on one of the walls of the ruins of the old church at Blair Athole, to mark the burial-place of the late Duke of Athole. The tablet will occupy a position immediately over the vault which contains the remains of the duke, and also those of Claverhouse. It is 7 ft. in height, and bears an allegorical design in high relief, representing one of the duke's Highlanders, standing in a sorrowful mood, with his cheek resting on the butt of his reversed musket, beside the stump of an oak-tree, which, while yet green and flourishing, had been broken by a tempest. One branch of the oak-tree remains attached to the stump, and on that the mantle of the deceased duke hangs. Mr. Steell has been commissioned to execute a monument of the late Earl of Shrewsbury. The monument is to be in the form of an effigy tomb.

THE PEABODY FUND INCREASED.—Mr. Peabody, not satisfied, it appears, with what he has already done in the establishment of this fund, but entirely satisfied with the way in which it is managed, has just given notice of an addition of 100,000*l.*, thus making a total of 350,000*l.*

DESICCATION AS APPLIED TO THE INDUSTRIAL ARTS.—A business pamphlet on this subject, with reference to the use of "Davison's Patent Thermantérion, or Hot-air Fan System" has been printed at Edinburgh, by E. Ravenscroft. It treats at some length on the seasoning and preservation of timber, the drying of corn, malt, hops, paper, silk, yarns, &c., and on the warming and ventilation of buildings and ships. It is a useful pamphlet irrespective of the merits of Davison's hot-air fan apparatus, which seems to be an efficient desiccator, as well as a ventilator of large buildings and ships. The use of it in drying corn, &c., takes anything like novelty out of Mr. Gibbs's scheme. The chapters on ventilation, and on the desiccation of timber and of corn, are interesting.

THE NEW FONT IN DUDLEY CHURCH.—The font given by the Earl of Dudley has just been formally used for the first time. It was designed by Mr. Forsyth, sculptor, who designed the Dudley Fountain, of which we gave a view in March last. The font is in all 11 ft. high, and of Caen stone. The style is that of the fifteenth century. The plan is an irregular octagon, and the Scriptural subjects, used to illustrate the work, are "The Baptism of our Lord," "The Baptism of the Eunuch," "Suffer Little Children to Come unto Me," and "The Presentation in the Temple." These are sculptured on the four larger sides of the font, the smaller sides forming canopies to the statuettes of the four evangelists underneath, who, with four figures of angels in groined arches, appear to form and support the base of the font. The cover is of oak, carved. It rises tapering, pinnacle above pinnacle, until the whole culminates in the figure of an angel, and is suspended by two ornamental wrought-iron brackets, with compensatory weights. Mr. Bellamy, a townsman, executed this font from designs by Mr. Forsyth.

RESTORATION OF GLOUCESTER CATHEDRAL.—The restoration of the south porch has now been taken in hand. This effected, there will remain only the restoration of the buttresses on the south side to complete the external work of the chief portion of the fabric. At a recent meeting of the Dean and Chapter, Mr. Scott produced his design for the restoration of the choir. His plans received the unanimous approval of the dean and canons, and instructions were given that the work should be taken in hand without delay. The restoration of the choir will of necessity occupy at least two years, and during that time service will be held in the nave. The reredos is intended to be composed of stone and mosaic work; it will extend nearly the whole width of the screen; it will be surmounted with tabernacle work, and canopied; the centre panel will contain a carved representation of the crucifixion of our Lord; and other appropriate subjects will be represented in the side panels. Mr. Scott's original estimate for all the work required was 45,000*l.* Already about 10,000*l.* have been spent. The restoration of the choir will involve an outlay of at least 13,000*l.*

THE ISLINGTON AND CITY RAILWAY.—The line of railway already noticed by us as one of the projects before Parliament is to be a light railway of narrower gauge than the country railways. The gauge will be 3 ft., and the line will form a continuous bridge or viaduct. The average gradient is under 1 in 255, and the greatest is 1 in 86, extending over a distance of 270 yards. The average height of the line above the ground is 18 ft. "The perfect safety and economy of a gauge less than that ordinarily adopted," says the prospectus, "have been already proved by the experience of years both at home and abroad. The Festiniog Railway (gauge only 2 ft.) has, during the year, carried 120,000 passengers and 125,000 tons of goods, and there has not been a single accident during the four years since locomotive power has been placed on the line. It has been most favourably reported on by Captain Tyler, R.E., the Government inspector." The proposed line will run from the Angel pretty nearly in the route of the projected new road to the city. It will end at the Moorgate-street station of the Metropolitan. The engineers are Messrs. Robert Richardson, C.E., and John Imray, C.E. An immense traffic is anticipated.

WATER CISTERNS.—With reference to the recent recommendation of slate cisterns, a manufacturer wishes us to mention that cisterns made of glazed "terra-cotta" are equally as good and much cheaper than slate, and are rapidly coming into use.

THE MARKET HALL, KIDDERMINSTER.—A meeting of the building committee was held at the Guildhall last week, in reference to the rebuilding of the Market Hall. The mayor (Mr. W. Cowen) presided. Plans were produced by Mr. Baker, the borough architect, and approved of, and tenders will shortly be advertised for.

ROBERT HOOKE.—Sir: From the interesting enumeration of the achievements of this great philosopher, farnished by your correspondent "H.," in a recent number, is omitted the most important of them all, viz., the origination of the undulatory theory of light. Dr. Whewell considered that he had anticipated, also, the *principle of interference*. (See "Hist. of Inductive Phil.," vol. ii., p. 391.)—M.

A STEAM-ROLLER.—The Liverpool corporation recently purchased a steam-roller for levelling and smoothing newly-made and mended roads. In that capacity the monster, locally known as "The demon crusher," has been a great success; but it has, unfortunately, so injured the network of gas and water pipes in the streets in which it has been used, that the corporate authorities find that they must either greatly decrease its weight or cease using it altogether in certain parts of the town.

LIVERPOOL ARCHITECTURAL SOCIETY.—Mr. Francis Horner presided over the fifth meeting of this society, for the twenty-first session, held last week. Mr. Wm. Keith, photographer, of Hardman-street, exhibited a number of permanent *fac-similes* of the drawings in the Louvre Museum, reproduced by M. Braun, of Dornach, the copies of the engravings having been made by the process invented by the Autotype Printing and Publishing Company. The paper for the evening was read by Mr. H. H. Vale, the subject being "A Trip to Staffa and Iona."

OXFORD ARCHITECTURAL SOCIETY.—A meeting was held on the 2nd inst., at which the secretary of the society, Mr. James Parker, gave an account of the Roman occupation of Dorchester in this county. He described the march of Aulus Plautius, and the difficulties which had to be met with in reconciling the short record preserved by Dion Cassius, with existing remains and the general aspect of the country. He considered that the Roman general passed along the south side of the Thames, and formed a camp at Cirencester, and that he then returned along the north side till, arriving at Dorchester, he had to pass across the river. In order to effect this Sinodum Hill, the British fortress, had to be taken, and here was the chief battle of the campaign. He also made some remarks upon the numerous discoveries of Roman remains in Dorchester, which city had sprung up in consequence of the neighbouring camp. The Rev. W. Jackson made some remarks upon the question of the Ise, the origin of the Isis; and after a paper on "Apsidal Churches," by Mr. E. C. Bruton, the meeting separated.

CONCRETE BUILDING.—A patent has been granted to C. Drake, Kennington, for "Construction of concrete buildings." The patentee claims, first, the construction and use of, in erecting concrete buildings, apparatus consisting of flanged iron plates, supported by iron uprights secured against the face of the wall, such plates being capable of being shifted upwards step by step upon the uprights, and of being locked to them in the several positions by bolts or pins passing through holes in the uprights, and in the flanges of the plates. He also claims the construction and use of angle plates to form the angles or corners of walls, as described. He also claims the use to connect the front and back plates and uprights, of metal straps with pinholes in them at various distances, so that the length may be adjusted to the thickness of the wall required, such straps passing through holes prepared for them in the uprights and plates, as described. He also claims the combining scaffold brackets with the uprights, as described. He also claims the construction and use, in erecting concrete buildings, of apparatus consisting of frames connected or bolted directly the one to the other, and tied together by straps passing through the wall, such frames being capable of being shifted upwards step by step upon the straps which are built into the wall.

Velocipedes.—Several correspondents wish to know where good velocipedes can be bought. We must leave advertisers to answer this inquiry.

The National Cottage Hospital for Consumption and Diseases of the Chest.—Owing to the liberal response of the benevolent public to the appeals made by the general committee on behalf of this charity, the erection of the first pair of buildings is already far advanced, in Ventnor, in the Isle of Wight. Upwards of 2,000 shrubs for the grounds of the hospital have been presented.

Medical Officer, St. Pancras.—The vestry of St. Pancras, being about to appoint a medical officer of health, in the place of the late Dr. Hillier, has resolved to increase the salary from 250*l.* to 300*l.* a year, and to require that the officer shall reside in the parish on entering upon his duties. It was stated by several vestrymen that a number of medical men of the highest attainments and position had canvassed for their support.

Inauguration of Bellringers at Tiverton. The inangural festival of the St. Peter's Society of Change Ringers has been held. They procured the services of the St. Stephen's Society of Change Ringers, Bristol, who enlivened the town for two days by their well-known skill in bell-ringing. The Rev. H. T. Ellacombe also delivered a lecture on bells on the occasion. The Tiverton Society have advertised their charges for ringing: a full peal for a day costs 3*l.*; for half a day, 2*l.*; for an hour, 1*l.*; a muffled peal for an hour, 3*l.*

Accidents.—At Hastings a bricklayer met with an accident while at work at a house which is being erected near Warrior-square. He was ascending a ladder, and a fellow-workman who was above him accidentally dropped a coil of rope, which knocked him off the ladder to the ground, a distance of about 30 ft. Fortunately no bones were broken, but he sustained a severe sprain of the ancle.——As a labourer was employed at a house in course of erection in Richmond-terrace, Edinburgh, a portion of the scaffolding gave way and precipitated him to the ground, a distance of nearly 25 ft. His wrist was fractured, and his head and body were much cut and bruised.—— The new tower of the parish church of Moirans (Isère) has fallen to the ground, doing considerable damage to the roof and nave. The cause of the disaster was the elevation of the structure without means being taken to strengthen the base, which at last gave way beneath the additional weight. Only a few hours before, the church was filled with people.

The Late Mr. Thomas Duncan, C.E.—Mr. Duncan, the water engineer to the Liverpool corporation, has recently died. He belonged to Perth, and was selected by Mr. James Walker, civil engineer, to execute his plans for the construction of the lighthouse on Fern Island. This lighthouse was the first step made by Mr. Duncan towards that eminence which he subsequently attained as an engineer. His reputation in carrying out submarine works was confirmed by the skill with which he executed other commissions entrusted to him by Mr. Walker. His introduction to Liverpool was as early as the year 1843, when he accepted the position, under Mr. James Simpson, C.E., of assistant engineer to the Liverpool and Harrington Waterworks Company, before the corporation had taken the waterworks into their own hands. Mr. Duncan soon after coming to Liverpool, was appointed assistant to Mr. Newlands, the borough engineer, and he had continued in the service of the corporation from that time down to the day of his death. When the waterworks were purchased by the corporation Mr. Duncan was placed in sole charge of them, and he had become recognised as the Liverpool water engineer when the Rivington Pike scheme of Mr. Thomas Hawksley, C.E., of Nottingham, was broached. In addition to the five lakes or reservoirs designed by Mr. Hawksley,—the Upper and Lower Rivington, the Anglezark, the Rakebrook, and the Lower Roddlesworth,—two subsidiary reservoirs, one at Roddlesworth and one at Prescot, have been since designed and completed by Mr. Duncan, besides improvements which he has made in the other works at Rivington, and the preparation and execution of the plans and designs for the various receiving reservoirs at Liverpool. He has left a widow in adverse circumstances, arising from heavy losses, which had swept away the investments of years.

TENDERS.

For the erection of premises, 46, Strand. Mr. T. C. Clarke, architect. Quantities supplied by Mr. Mark W. King:—

Henshaw	£2,047	0	0
Wheeler & Co.	1,992	0	0
Clements	1,914	0	0
Kelley, Bros.	1,765	0	0
Kilby	1,747	0	0
Brass	1,703	0	0
King & Sons	1,699	0	0
Scrivener & White	1,646	0	0
Abraham	1,516	0	0

For completion of villa residence, No. 5, Brokes, Reigate, for Mr. G. E. Morrison. Mr. J. F. Matthews, architect:—

Barnes	£999	0	0
Nightingale, Brothers	935	0	0
B. E. Nightingale	928	0	0
Gage	925	0	0
Cook	918	0	0
Room	895	0	0
Holdsworth	875	0	0

For new infirmary, &c., Godstone Union. Mr. A. R. Stenning, architect:—

Knight	£3,900	0	0
Morriss	3,899	0	0
Worsell	3,891	0	0
Cooper	3,600	0	0
Galyer & Moore	3,550	0	0
Sherwood	3,540	0	0
Cook	3,535	0	0
Grover	3,495	0	0
Barnes	3,400	0	0
Kesterton & Head	3,293	0	0
Smart	3,250	0	0
Webb & Sons	3,250	0	0
Dannell	3,200	0	0
Henshaw	3,164	0	0
Till	3,150	0	0
Macey	3,109	0	0
Colls & Sons	3,080	0	0
Bayes	3,072	0	0
Nightingale	3,063	0	0
Knight	3,059	0	0
Regis	3,050	0	0
Johnson (too late)	3,049	0	0
Woodward (accepted)	2,900	0	0
Constable & Bakey	2,890	0	0
Gage	2,510	0	0

For sewage utilization works for the Romford Local Board of Health. Amended plan. Messrs. Rues & Minns, engineers:—

Contract No. 1. Sewer and Buildings.

F. & J. Wood	£3,443	0	0
Merrant	3,225	0	0
King	3,021	0	0
Crame	3,020	0	0
Neave & Fry	2,998	0	0
Burgess	2,900	0	0
Bloomfield	2,584	0	0
Hubbard	2,580	0	0
Young	2,450	0	0
Porter	2,350	0	0

Contract No. 2. Engines, &c.

Campbell, Johnstone, & Co.	£2,200	0	0
Barrows & Stewart	1,732	10	0
Kirkham	1,278	13	9
E. & J. Wood	1,166	0	0
Bower	1,148	0	0
Bells, Goodman, & Co.	1,140	0	0
Whieldon, Lecky, & Lucas	1,100	0	0
Wilkins	1,060	0	0
Williams	1,050	0	0
E. R. & F. Turner	1,050	0	0
Burton, Sons, & Waller	1,042	0	0
Laidlaw & Co.	1,037	0	0
Protheroe & Bastin	998	15	6
Perkins, Brothers	986	0	0
Parnell	979	10	6
Cligg & Co.	953	0	0
Whitmore & Benyon	945	0	0
Rogers	891	10	0
Bevington, Courtland, & Baker	883	15	0
Davey	830	0	0
Gimson & Co.	797	5	0

For erecting a warehouse in Ropemaker-street, Finsbury, for Messrs. G. Bartholomew & Co. Mr. F. G. Widdows, architect:—

Webb & Sons	£6,180	0	0
Ennor	6,047	0	0
Chessum	5,794	0	0
Colls & Son	5,684	0	0
Newman & Mann	5,586	0	0
Pritchard	5,557	0	0
Bishop	5,550	0	0
Brass	5,379	0	0
Henshaw	5,347	0	0
Browne & Robinson	5,280	0	0
Killby	5,227	0	0
Hill, Keddell, & Waldram*	5,196	0	0

* Accepted.

For erecting forty-four almshouses, chapel, and lodge, with boundary walls, drains, &c. for the Worshipful Company of Drapers, at Elmslea, Tottenham, Middlesex. Mr. Herbert Williams, architect. Quantities supplied by Mr. Charles Reilly:—

Trollope & Sons	£15,989	0	0
Brass	15,667	0	0
Piper & Co.	15,391	0	0
Conder	14,997	0	0
Barnsley & Sons	14,670	0	0
Ashby & Sons	14,165	0	0

For repairs, pulling down, rebuilding, and building new workshops in the rear of five houses in James-street, Goswell-street, for Mr. D. Donovan. Mr. Hammond, of Finsbury-square, surveyor:—

Lewis	£565	0	0
Follett	471	0	0
Starkey	457	10	0
Preedy	450	0	0
Stockwell	438	0	0
Wilson	2880	0	

For six houses at Lewisham. Mr. Banks, architect:—

Belham	£2,700	0	0
Smith	2,623	0	0
Staines & Son	2,478	0	0
Bennett	2,451	0	0
Jackson	2,435	0	0
Hanks	2,400	0	0
Wevell	2,325	0	0
Raby	2,217	0	0
Turner	2,097	0	0
Harrison & Edwards	1,980	0	0
Dixon	1,910	0	0
King	1,800	0	0
J. & W. Hobern	1,798	0	0
Walker	1,794	0	0
Blackmore & Morley	1,770	0	0
Ladd	1,764	0	0
Williams	1,740	0	0
Wise	1,740	0	0
Pethick	1,700	0	0
Hughesdon	1,650	0	0
Bridel	1,435	0	0
Heaysman	1,388	10	0

For alterations to the Barley Mow Tavern, Smithfield. Messrs. Haywood & Blashill, architects:—

Mather & Read	£295	0	0
Langmead & Way	280	0	0
Tully	277	0	0
Nind	235	0	0

For house, Cheyne-row, Chelsea. Mr. P. Webb, architect:—

Thorne & Co.	£2,120	0	0
Haward & Son	1,951	0	0
Lathey, Brothers	1,912	0	0
Ashby & Sons	1,897	0	0
Brass	1,887	0	0
Adamson & Sons	1,859	0	0
Foster	1,850	0	0
Sharpington & Cole	1,843	0	0

For pier, &c., at Mousehole Harbour, near Penzance. Quantities supplied by Mr. Joseph Simmons. Mr. Douglas, engineer, Trinity Works, Penzance:—

Robbins	£7,496	13	6
Flavin	6,500	0	0
Freeman & Son	5,700	0	0
Sharpe, Brothers	5,620	0	0
Hibbard & Long	5,054	0	0
Moore	4,993	0	0
Keswick	4,497	0	0

For restoration of Kelshall Church. Messrs. Nash & Son, Royston, architects:—

	A. Memel roof.			A. Pitch pine.			B. Fittings.		
Ginn	£1,284	0	0	£1,330	0	0	£351	0	0
Gibbons	1,255	0	0	1,312	0	0	341	0	0
Gimsin	1,197	0	0	1,267	0	0	253	0	0
Brown	1,135	0	0	1,265	0	0	280	0	0

For forming bay windows, basement, &c., to Oak Deanvilla, Norwood. Mr. Danby, architect:—

Richards	£506	0	0
Roberts	497	0	0
Deadman	478	0	0
King & Sons	429	0	0

For sewers at Kensington Park, for Mr. Stephen Marten. Mr. R. Whitchurch, surveyor:—

Wigmore	£1,670	0	0
Hollins	1,100	0	0
Bareham	775	0	0
Parker	759	0	0
Killingback & Bradley	740	0	0
Williams	730	0	0
Nicholson	715	0	0
Crockett	700	0	0
Hubbard	683	0	0
Young	670	0	0
Potter	685	0	0
Bloomfield	645	0	0
Ossenton & Carter	625	0	0
Tossell (accepted)	591	0	0

TO CORRESPONDENTS.

C. P. (happy to receive particulars).—*Vezata Quæstio* (consult the schedule of charges issued by the Institute of Architects).—J. S. (recovery would be very doubtful).—R. E. N.—J. N.—J. M. L.—T. W.—F. E. W.—W. G. S.—J. H.—M. H. B.—A. F.—F. G.—A. G.—C. S.—J. G. W.—C. R.—W. H.—F. G. W.—W. S. P.—H. K. & H.—H. S. M.—N.—M. U.—R. H. C.—N. H. J. W.—J. F. T.—W. R. C.—T. B.—N. & Son.—A. H. L.—Anti-Sham (next week).—A. M. (next week).—A. S. (next week).—J. D. M. (next week).—J. F. (next week).

We are compelled to decline pointing out books and giving addresses.

All statements of facts, lists of Tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

Note.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

CHRISTMAS WEEK. "The Builder" for the week ending DECEMBER 26th will be published on THURSDAY, 24th inst., at the usual hour.

ADVERTISEMENTS for insertion in that issue must therefore reach the Office before THREE O'CLOCK p.m., on WEDNESDAY, 23rd inst.

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